



# MULTI-DONOR STRATEGY FOR GEOTHERMAL DEVELOPMENT IN EAST AFRICA

## FINAL VERSION

### SEPTEMBER 2015

September 1, 2015

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***DISCLAIMER:***

*The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.*

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## ABBREVIATIONS

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AfDB	Africa Development Bank
AFD	French Development Agency
ARGeo	African Rift Geothermal
AUC	African Union Commission
BGR	Federal Institute for Geosciences and Natural Resources of Germany
BTC	Belgian Technical Cooperation
CAO	Chief Administrative Officer
DFID	Department for International Development
EDC	Energy Development Corporation (Rwanda)
EDD	Electricity de Djibouti
EEA	Ethiopian Electricity Agency
EEP	Ethiopian Electric Power Office
EIA	Environmental Impact Assessment
EIB	Europe Investment Bank
EOI	Expression of Interest
EPC	Engineer, procure, construct
ERA	Electricity Regulatory Agency (Uganda)
ERC	Energy Regulatory Commission (Kenya)
EU	European Union
EUC	Energy Utility Corporation (Rwanda)
EWSA	Energy, Water and Sanitation Authority
EWURA	Energy and Water Utilities Regulatory Authority
FCPA	Foreign Corrupt Practices Act
FIT	Feed-in tariff
GDC	Geothermal Development Company (Kenya)
GDU	Geothermal Development Unit (Rwanda)
GEF	Global Environment Facility
GIZ	German Technical Cooperation
GOK	Government of Kenya
GOR	Government of Rwanda
GoT	Government of Tanzania
GPT	Geothermal Power Tanzania Limited
GRMF	Geothermal Risk Mitigation Facility
GSE	Geothermal Survey of Ethiopia
GST	Geological Survey Tanzania
ICEIDA	Icelandic International Development Agency
IFC	International Finance Corporation
IPP	Independent Power Producer
JICA	Japan International Cooperation Agency
KenGen	Kenya Generating Company
KetraCo	Kenya Transmission Company
KfW	Kreditanstalt für Wiederaubau
KPLC	Kenya Power and Light Company
MEM	Ministry of Energy and Minerals (Tanzania)
MININFRA	Ministry of Infrastructure (Rwanda)



MOU	Memorandum of Understanding
MoE	Ministry of Energy, Water, and Natural Resources (Djibouti)
MOWIE	Ministry of Water, Infrastructure, and Energy (Ethiopia)
MW	Megawatt
NDF	Nordic Development Fund
ODDEG	Office for Development of Geothermal Energy (Djibouti)
OFID	Office for International Development
O&M	Operations and maintenance
OPIC	Overseas Private Investment Corporation
PA	PowerAfrica
PPA	Power purchase agreement
PPP	Public-private partnership
PSMP	Power System Management Plan (Tanzania)
REA	Rural Energy Agency (Tanzania)
REG	Renewable Energy Group (Rwanda)
REI	Reykjavik Energy
RG	Reykjavik Geothermal
RURA	Rwanda Utilities Regulatory Agency
SIDA	Swedish International Development Cooperation Agency
SREP	Scaling-up Renewable Energy Program
Tanesco	Tanzanian Energy Services Company
TGDC	Tanzanian Geothermal Development Company
TZS	Tanzanian shillings
UECCC	Uganda Energy Credit Capitalization Company
UEDCL	Uganda Electricity Distribution Company Limited
UETCL	Uganda Electricity Transmission Company Limited
UNEP	United Nations Environment Programme
UNU-GTP	United Nations University Geothermal Training Program
USAID	United States Agency for International Development
USD	United States Dollars
WB	World Bank

## UPDATES FROM AUGUST 2014 DRAFT

The September 2015 final version of the Multi-Donor Strategy for Geothermal Development in East Africa (the “Strategy”) contains numerous updates to data, project updates, donor strategies and priorities, and incorporates comments and feedback from numerous stakeholders, which was solicited to gain broad support for this final version of the strategy.

As appropriate, Power Africa and its partners may update the strategy from time to time to allow it to serve as an up-to-date reference for developments in geothermal in the region for planning, discussion, and coordination purposes. Some of the key updates include:

- Incorporation of all comments from key stakeholders:
  - African Development Bank
  - DFID
  - Enel Green Power
  - European Union
  - Fichtner
  - Government of Djibouti
  - Government of Ethiopia (MoWIE)
  - Government of Rwanda
  - IFC
  - KfW
  - Ormat
  - Parhelion
  - USAID
- Recommendations updated to reflect new donor programs, development progress, etc.
- Updates to grid sizes and other key facts around electricity generation and consumption
- Updates of technical assistance and project development activity
- Chart showing levelized and long run cost of power for geothermal compared to other renewable and conventional energy sources

## REVIEW OF PROGRESS ON TECHNICAL ASSISTANCE AND PROJECT DEVELOPMENT PIPELINE

Major updates, developments, and recommendations by country and region include:

### Djibouti

- ODDEG formalized under the Office of the President as the official entity overseeing geothermal development.
- IPP law passed; implementing regulations in development.
- Tender for Geothermal Consulting Company (GCC) and other experts issued; team to be fielded by September 2015.
- Donor assistance is largely focused on building ODDEG capacity and assisting with the IPP law to prepare for the anticipated drilling and IPP tender in 2016-2017.
- Indicator 1.1 (Government Support – Legal/Policy) upgraded from low to medium to reflect formalization of ODDEG.

### Ethiopia

- Corbetti PPA signed; initial drilling to commence in late 2015.
- IFC structuring and legal analysis completed; in process of restructuring management of geothermal. Donors collaborating to implement remaining recommendations for enabling environment.

### Kenya



- Commissioning of Olkaria I, units 4 and 5 in January 2015.
- The Menengai (3x35MW) project is moving forward, with the resource proven (according to a resource report), and the IPPs working on obtaining project finance and negotiating with EPC contractors.
- Kenya's first entirely privately developed project since Olkaria III (Akiira) spud its first well in August 2015.

#### Rwanda

- JICA and ISOR surface studies and analysis complete; both indicate commercial potential for geothermal in Rwanda.

#### Tanzania

- Tenders for AfDB technical assistance issued, and technical review nearly complete.
- DFID planning assistance to TGDC (business planning/structuring)
- World Bank/ESMAP considering assistance program

#### Uganda

- Numerous private concessions in development; assistance needed to improve enabling environment (concession development process, power purchase price, etc.) for private sector development

#### Regional

- Launch of the DFID/EAGER rapid response vehicle, primarily focused on enabling environment and policy
- Launch of the ICEIDA-sponsored feasibility study and design for a regional Centre of Excellence
- Anticipated launch of the Power Africa initiative to develop financing mechanisms for early stage and production drilling.

## TRENDS

- Focus on bankability—particularly tariff regimes that are commercial for private sector geothermal development. Power Africa is planning assistance to Djibouti, Ethiopia, Rwanda, and Uganda in geothermal project costing, modeling, and tariff calculation.
- Government involvement in early stage drilling, leading to IPP tender for remaining drilling and plant development. This model may fail to yield the successful IPP tenders that are anticipated.
- Development of common legal frameworks/regulations: a number of donors have been working toward model PPAs, geothermal laws, etc. While focusing on issues and concepts that are uniform in geothermal, caution should be taken in trying to find a “one size fits all” for any law, contract, etc. given the diversity of the region in terms of legal tradition, level of development, existing legal framework, local customs, etc.
- Support for region-wide capacity building. The culmination of this interest is the ICEIDA study for a regional Centre of Excellence. A proposed design will be presented to donors in August 2015.

# 1 INTRODUCTION

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Development of geothermal power is a complicated and risky business, with failures outnumbering success stories. When developed properly, however, geothermal is the only source of baseload, renewable energy, and can replace high cost, high polluting sources of energy. In East Africa,

Country	Approximate Geothermal Potential <sup>1</sup>	Current Grid Size (MW)	% of grid	Peak demand (MW)	% of peak demand
Djibouti	100	130 <sup>2</sup>	77%	70 <sup>3</sup>	143%
Ethiopia	5,000	2,470 <sup>4</sup>	200%	1,100 <sup>5</sup>	455%
Kenya	7,000 <sup>6</sup>	2,076 <sup>7</sup>	337%	1,480 <sup>8</sup>	473%
Rwanda	50	110 <sup>9</sup>	45%	80 <sup>10</sup>	63%
Tanzania	700	1,100 <sup>11</sup>	64%	1000 <sup>12</sup>	70%
Uganda	400	799 <sup>13</sup>	50%	450 <sup>14</sup>	89%
<b>Total</b>	<b>13,250</b>	<b>6,685</b>	<b>198%</b>	<b>4,180</b>	<b>317%</b>

geothermal resources meet or in some cases far exceed peak demand. Indeed, geothermal has the potential to be a significant source of power production in at least six countries in the region.<sup>1516</sup>

Geothermal is also very cost competitive with both conventional and renewable sources of energy. Using a levelized cost of energy (LCOE) analysis, geothermal compares

favorably with coal, gas, and wind, and is less expensive than solar, hydro, and nuclear.<sup>17</sup>

<sup>1</sup> The author has taken into account varying estimates from a number of sources, and estimated resource potential based on what could reasonably be expected to be developed in a country using conventional geothermal development practices, and not including newer technologies such as EGS.

<sup>2</sup> Energy Information Administration. <http://www.eia.doe.gov/countries/data.cfm>

<sup>3</sup> <http://www.reuters.com/article/2014/01/26/djibouti-electricity-idUSL5N0L004D20140126>

<sup>4</sup> Energy Information Administration. <http://www.eia.doe.gov/countries/data.cfm>

<sup>5</sup> Ibid.

<sup>6</sup> Government estimates are 10,000MW+

<sup>7</sup> Energy Information Administration. <http://www.eia.doe.gov/countries/data.cfm> with update from USAID/Kenya Mission

<sup>8</sup> Ibid.

<sup>9</sup> Energy Information Administration. <http://www.eia.doe.gov/countries/data.cfm> with update through <http://www.cnbcfrica.com/news/east-africa/2014/11/06/rwanda-energy-potentials/>

<sup>10</sup> <http://www.rwandaenergy.com/2012/05/rwanda-rwanda-start-power-rationing-demand-peaks/>

<sup>11</sup> Energy Information Administration. <http://www.eia.doe.gov/countries/data.cfm> with update from Tanzania Growth Diagnostic. Partnership for Growth. 2011. Rounded to nearest 100.

<sup>12</sup> <http://www.usea.org/sites/default/files/event-/Tanzania%20Power%20Sector.pdf>

<sup>13</sup> Energy Information Administration. <http://www.eia.doe.gov/countries/data.cfm>

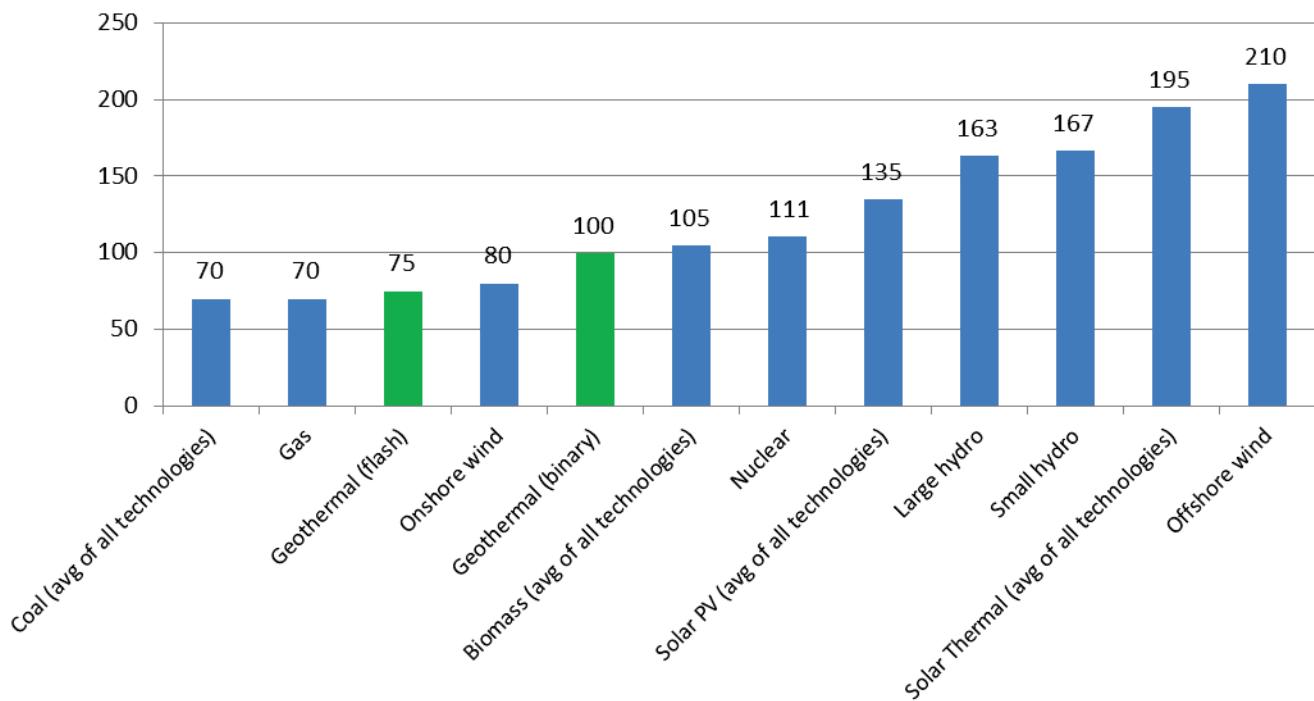
<sup>14</sup> <https://globalconnections.hsbc.com/canada/en/articles/uganda-energy-opportunity>

<sup>15</sup> Djibouti, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda

<sup>16</sup> AUC (through GRMF and other programs), focuses on 5 additional countries—Burundi, Comoros, Democratic Republic of Congo, Eritrea, Zambia

<sup>17</sup> “LCOE demonstrate electricity generation costs only, and thus do not represent the total cost of electricity supply such as grid connection or balancing costs for integration of volatile and intermittent RES (wind, PV). Neither does it include the costs of required back-up capacity based on conventional thermal plants, occasional capacity shedding and other additional system costs.” [http://www.worldenergy.org/wp-content/uploads/2013/09/WEC\\_J1143\\_CostofTECHNOLOGIES\\_021013\\_WEB\\_Final.pdf](http://www.worldenergy.org/wp-content/uploads/2013/09/WEC_J1143_CostofTECHNOLOGIES_021013_WEB_Final.pdf)

## Levelized Cost of Energy (Global Average) in USD/MWh



Source: World Energy Council 2013 Cost of Energy Technologies.

So why isn't geothermal a bigger part of the energy mix already? As mentioned above, development of geothermal energy is complicated and expensive. Developers must find and harness a fuel source thousands of meters below the ground. This takes numerous studies, planning, and analysis. It takes expensive equipment (drill rigs, casing, etc.). Resources are often in remote locations without easy access from roads, or close interconnection points. The average time to develop a new geothermal resource from initial surface studies to connection to the grid is about 5-7 years, but can take considerably longer. Getting projects up and running even in this seemingly long time frame takes the right legal and regulatory environment, a solid tariff regime (which may include Feed-in Tariffs (FIT), price floors, or other mechanisms or incentives to give developers comfort that they will be able to achieve a price for their geothermal energy that will result in a commercially viable project), ability to sign PPAs in advance at reasonable prices, etc.), sound technical expertise to execute all aspects of the project (from exploration to operation), and access to financing and risk mitigation products.

Ambitious targets for renewable energy in East Africa—sparked by power shortages, a desire to reduce dependency on expensive energy sources, and increased intermittency from drought—have led both country governments and donors to try to accelerate the development of renewable resources—including geothermal. This is a challenging undertaking, and donors and governments have not always followed a coordinated, strategic approach in a region that is still in the process of developing its legal, regulatory, and financial environments.

Given the challenges to developing geothermal in general, it falls to the donors, country governments, private developers, lenders, and regional bodies to work together to address some of



the systemic deficiencies that are preventing private developers from either entering markets or being able to successfully develop projects in others.<sup>18</sup>

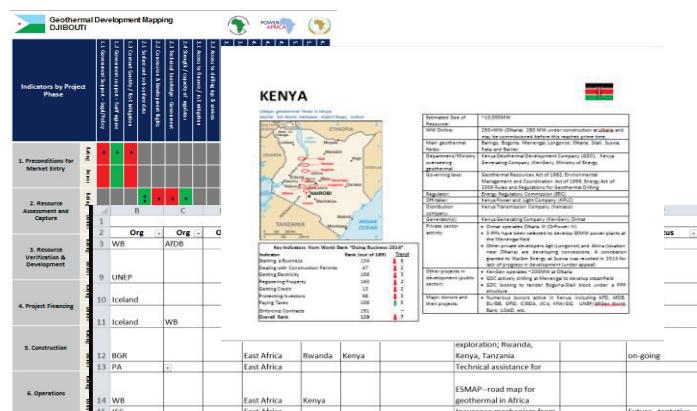
To this end, PowerAfrica (PA), in cooperation with the African Development Bank (AfDB) and the African Union Commission (AUC) has developed a multi-donor strategy for more coordinated, strategic, primarily private-sector led development of the geothermal resources in East Africa. The strategy focuses on six countries—Djibouti, Ethiopia, Kenya, Rwanda, Tanzania, and Uganda—the existing opportunities (i.e., transactions) in each country, as well as the additional assistance needs to encourage more private sector investment in geothermal. Finally, the strategy includes recommendations for assistance at a regional level to promote policies, capacity building (human resources, equipment and technology, and financial), information sharing and networking, and financing throughout East Africa.

While the strategy addresses some of the traditional donor priority areas related to creating an enabling environment for geothermal through policy assistance and capacity building, it is first and foremost a plan for bringing geothermal power plants on line as quickly as possible, by focusing on those transactions or projects that are in development or ready to be developed, but may need some assistance to mitigate remaining non-technical barriers (permitting, PPA negotiation, financing, etc.). This strategy prioritizes those countries where there is a clear commitment from the government to develop geothermal energy, where the environment for private sector development is sound or improving, and where there are either live transactions, or projects that could become live in the coming 12-24 months.

## 2 METHODOLOGY AND PARTNERS

The strategy examines all six countries, and rates them based on their progress against a common set of indicators for geothermal development. It has been built upon a detailed inventory of donor activity and gap analysis to identify the most acute areas of need in each country in terms of the enabling environment for private sector-led geothermal development. This donor activity database, gap analysis, and ranking are intended to be living documents that are updated at regular intervals to track progress by country and regionally, and provide information upon which countries and donors can come together to develop more targeted approaches to moving the sector forward.

<p>The strategy for geothermal development in East Africa is a joint effort of numerous donors, government officials, and private developers, all with a vested interest in finding a better way to developing geothermal and bringing baseload, renewable megawatts (MW) online. The need to improve and coordinate efforts in geothermal development was both recognized and formalized in January 2013 through a memorandum of understanding (MOU) between PA, AUC, and AfDB. Their cooperation was further reinforced at the African Growth and Opportunity Act (AGOA) meetings in August 2013.</p>	3. Resource Verification & Development	3 WB	AfDB								
		9 UNEP									
	4. Project Financing	10 Iceland									
	5. Construction	11 Iceland	WB								
	6. Operations	12 BGR									
		13 PA	(x)								
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	15 IFC										



<sup>18</sup> There are already a number of donor and stakeholder coordination groups in a number of East African countries. This strategy seeks to leverage these on-going efforts. In addition to country-specific coordination, a number of donors (e.g., DFID, ICEIDA, UNEP ARGeo, BGR, AUC-KFW GRMF are also working together regionally).



Since that time, the three partners have worked to coordinate efforts on geothermal development; this strategy is a result of those efforts. While PA, AUC, and AfDB have led the development of the strategy, a host of donors, government officials, private developers, lenders, insurers, and equity providers have been instrumental in providing input, guidance, and support for these efforts. A full list of those organizations and individuals consulted during the development of this report is included as an appendix to the full strategy document.

### 3 GEOTHERMAL STRATEGY AT-A-GLANCE

The chart below summarizes the most critical interventions for advancing geothermal development in East Africa, with a focus on those actions geared toward closing transactions and connecting MW to the grid. Further explanation of each country's situation, as well as a summary of those "live" and near-term transactions may be found in the subsequent sections. A more complete explanation of the methodology and rationale behind these conclusions is included in the full strategy document.

More specifics on donor assistance to each transaction are included in Appendix G.

Top Transactions					
Country	Transaction	Ownership	Project Stage	Description/Current Assistance	Recommended Assistance
Djibouti	Lake Assal (Fiale Caldera)	Public (IPP tender after early drilling)	• Early exploration	<ul style="list-style-type: none"><li>A consortium of 7 donors, led by the World Bank and the African Development Bank are implementing a \$31M project to carry out early drilling and well siting at Fiale Caldera</li><li>Once early drilling is completed, an IPP tender will be issued (assuming drilling is successful)</li><li>A Project Implementation Unit has been designated by the Government of Djibouti (GoDj) to coordinate with the donors</li><li>The project is in the process of hiring an international director and a geothermal consulting company that will oversee the project, in conjunction with the GoDj (ODDEG)</li></ul>	<ul style="list-style-type: none"><li>Provide capacity building assistance to ODDEG (the unit within GoDj (directly under the President) responsible for geothermal development</li><li>Provide assistance to improve the enabling environment for private sector development, leading up to the anticipated IPP tender; this assistance should be done through the lens of the recently passed IPP law, and it to-be-drafted implementing regulations</li></ul>
Ethiopia	Corbettii	Private	<ul style="list-style-type: none"><li>Resource Verification<ul style="list-style-type: none"><li>Concessions have been secured; Reykjavik Geothermal in the process of negotiating a PPA prior to starting drilling</li></ul></li></ul>	<ul style="list-style-type: none"><li>Up to 1,000MW project (over multiple fields); development led by Reykjavik Geothermal</li><li>In the middle of PPA negotiations for first pilot phase</li><li>GRMF providing funding assistance</li><li>Power Africa assisting with negotiations of PPA</li></ul>	<ul style="list-style-type: none"><li>Corbettii negotiations are driving reform in the country. The Corbettii transaction will likely guide future tenders and negotiations (e.g., those upcoming at Tendaho).</li><li>Maintain support to Reykjavik Geothermal and the Government of Ethiopia to keep transaction moving forward.</li></ul>

### Top Transactions

Country	Transaction	Ownership	Project Stage	Description/Current Assistance	Recommended Assistance
Kenya	<b>Akiira</b>	Private	<ul style="list-style-type: none"> <li>Resource Verification and Early Development</li> </ul>	<ul style="list-style-type: none"> <li>Up to 140 MW (in 70 MW phases) at resource near Olkaria; development led by Akiira Geothermal.</li> <li>Akiira has secured land and completed the civil works for drilling (well pads, access roads, etc.). The PPA has been signed. Munich Re insurance has been signed and a National Environment Management Authority (NEMA) license has been issued. Akiira has received a \$1.0MM grant from OPIC ACEF program to support development activities, as well as a grant from GRMF for drilling.</li> <li>Drilling will commence in Q3 2015.</li> <li>GRMF grant was lower than develop expected and a protest has been lodged.</li> </ul>	<ul style="list-style-type: none"> <li>Donors should provide greater support to help advance the private development model in Kenya. Transaction facilitation (structuring, negotiation assistance, etc.) on behalf of the government to streamline and expedite the process and assistance to developers with financing (particularly for production drilling) are most critical.</li> </ul>
Kenya	<b>Agil (Longonot)</b>		<ul style="list-style-type: none"> <li>Resource Verification</li> </ul>	<ul style="list-style-type: none"> <li>Up to 70MW development led by Agil.</li> <li>Agil has a signed PPA, and had made significant progress in civil works and financing (GRMF award, indicative terms on insurance and financing), but has encountered difficulties with obtaining water, community relations, and investor turnover.</li> </ul>	<ul style="list-style-type: none"> <li>Donors (led by Power Africa) to work with developer to determine if project issues can be resolved, and what assistance would be most valuable in terms of moving the project forward.</li> </ul>

### Top Transactions

Country	Transaction	Ownership	Project Stage	Description/Current Assistance	Recommended Assistance
Kenya	<b>Menengai</b>	PPP	• Project Financing	<ul style="list-style-type: none"> <li>• GDC is developing the 105 MW steamfield, and has awarded 3x35MW contracts to 3 IPPs to construct separate power plants.</li> <li>• Steam supply agreements, PPAs, and Generation Licenses were signed in September 2014.</li> <li>• AfDB is leading the financing and risk guarantee process. Private developers will likely need assistance navigating the project financing process, as the 3x30 model could provide significant challenges in terms of bankability.</li> <li>• Lengthy PPA and SSA process has slowed down the financing schedule, leading to extended delays in the project. Investigate potential bridge funding programs to allow IPP's to proceed with procurement of long lead equipment.</li> <li>• GDC is in initial stage of developing the next 2 x 30 MW program. The Expression of Interest (EOI) program has been initiated and a shortlist of qualified IPP's selected.</li> <li>• GDC is in the progress of planning the next 3 x 100MW development at Menengai</li> <li>• GreenMax has been contracted through AfDB funding to provide transaction support for this program</li> </ul>	<ul style="list-style-type: none"> <li>• GDC is in need of Project Management support for all projects. Extensive GDC development program will not be possible without a highly qualified management staff and management program. PA can support this effort through embedded management team, program development and capacity building</li> </ul>

### Top Transactions

Country	Transaction	Ownership	Project Stage	Description/Current Assistance	Recommended Assistance
Kenya	Baringo-Silali	PPP/JDA	<ul style="list-style-type: none"> <li>Resource Assessment and Capture</li> </ul>	<ul style="list-style-type: none"> <li>UNEP, through the ARGeo project, has supported GDC in developing the conceptual models to locate target sites for deep drilling</li> <li>GRMF has provided funding</li> <li>KfW has provided an approximate \$100 million loan/grant program to GDC to fund initial infrastructure development and exploration drilling (20 wells)</li> <li>GDC has released a RFP for drilling services, with a target to drill 3-5 wells at each of the resource blocks</li> <li>GDC has released and RFP for development of the water supply system to each of the resource blocks and neighboring communities. The value of this water supply system has been estimated at \$20+ million USD.</li> <li>USAID/PA is supporting GDC in the preparation of a joint development agreement (JDA) / public private partnership (PPP) model to develop this field and power plant. Provide support to the GDC to finalize its JDA/PPP term sheet so that it is bankable and help GDC prepare all the requisite documents and information needed by investors</li> </ul>	<ul style="list-style-type: none"> <li>Support GDC in preparation of development plan documents that will provide necessary project data to support private investor due diligence (project structure, joint development governance, financial model, geothermal resource report, realistic program schedule, project budget, front end engineering design, etc.)</li> <li>Promote and provide financial support to developers wishing to bid/respond to GDC's offering</li> <li>Provide project risk guarantee mechanism to provide investor backstop</li> </ul>

### Top Transactions

Country	Transaction	Ownership	Project Stage	Description/Current Assistance	Recommended Assistance
Kenya	Olkaria VI	PPP/JDA	• Resource Verification	<ul style="list-style-type: none"> <li>2x70MW expansion of Olkaria field.</li> <li>KenGen has issued 3 separate EOIs for Olkaria VI (2 x 70MW) — Transaction, Financial and Environmental. The expressions of interest (EOI) have closed, but shortlisted companies have not been announced.</li> </ul>	<ul style="list-style-type: none"> <li>Provide peer review, management and potential funding for the advisory services noted above. This may be developed in coordination with the IFC which has expressed an interest in the same support role.</li> <li>Provide support to KenGen in structuring and eventually negotiating the PPP and preparing all the requisite investor documents and in the review of technical bids</li> <li>Provide support to KenGen to prepare the RFP and evaluate bids.</li> <li>Consider support to shortlisted companies to prepare commercial and technical bids.</li> </ul>

### Key Interventions/Recommendations

Country	Description
Kenya	Continued assistance to GDC and KenGen —it is critical to get the GDC's joint development agreement model (or models) and KenGen's PPP structure right, and provide the necessary technical, legal, policy and institutional support to both GDC and KenGen to engage with the private sector and advance these new project and investment structures. The region looks to GDC and KenGen as its model for geothermal development.
Kenya	Provide support to GDC on development of the appropriate Project Management structure to allow efficient project execution
Kenya	Support KenGen in coordination with US EXIM to expedite the funding of the Olkaria I rehabilitation project
Ethiopia	Coordination with IFC on follow on work for structuring the legal and regulatory framework and building the institutional capacity , implement and/or manage projects and the sector at large
Tanzania	Assistance to TGDC and the Ministry of Energy and Minerals (MEM) to determine appropriate structures and roles in promoting geothermal energy development and in adopting a transparent legal and regulatory framework respectively
Rwanda	Peer review of JICA and ISOR technical reports, and additional study of geothermal fields to determine path forward
Djibouti	Assistance to the Office for Development of Geothermal Energy (ODDEG) to build capacity; assistance with drafting of implementing regulations for IPP law
Regional	Development of new risk mitigation and financing mechanisms to address production drilling risk and procurement of long lead items required prior to close of finance (through bridge financing facility)
Regional	Support for geothermal association and development of regional training programs (Center of Excellence)

## 4 OPPORTUNITIES FOR GEOTHERMAL DEVELOPMENT—PRIORITY COUNTRIES AND TRANSACTIONS

The level of policy development, human resources, and overall resource size and characteristics vary widely across the six countries in this strategy. Equally variable is the government commitment to geothermal development and the overall environment for private sector developers. In assessing the countries in terms of their enabling environment for private sector geothermal development, the ranking were weighted by those most critical to private sector market entry (the phase most of the countries are in), concession development and permitting, access to finance, and off-take.

In the full strategy paper, a detailed analysis of each country is included. The section below summarizes the key takeaways from these reports. The rankings below represent how “friendly” the countries are for private sector development, and are intended to be the order of priority for donor assistance.

	1. Preconditions for market entry				2. Resource Assessment and Capture				3. Resource Verification and Development				4. Project Financing			5. Construction		6. Operations		
Indicators by Project Phase	1.1	1.2	1.3	1.3a	2.1	2.2	2.3	2.4	3.1	3.2	3.3	3.4	4.1	4.2	4.3	5.1	5.2	6.1	Score	RANK
Multiplier	3	2	4	1	1	2	1	1	2	1	2	1	2	2	1	1	1	1		
<b>KENYA</b>	♦♦	♦♦	♦♦♦	♦♦♦	♦	♦♦	♦♦	♦♦	♦♦	♦♦♦	♦♦	♦♦♦	♦♦	♦♦	♦	♦	♦♦	♦	61	1
<b>RWANDA</b>	♦♦	♦	♦♦♦	♦	♦♦	♦	♦♦	♦♦	♦♦	♦	♦	♦	♦♦	♦♦	♦♦	♦	♦	♦	52	2
<b>ETHIOPIA</b>	♦♦	♦♦	♦	♦	♦♦	♦	♦♦	♦	♦♦	♦♦♦	♦♦	♦♦	♦♦	♦♦	♦♦	♦♦♦	♦	♦	50	3
<b>UGANDA</b>	♦	♦♦	♦	♦	♦♦	♦	♦♦	♦♦	♦	♦♦	♦♦	♦♦	♦♦	♦♦	♦♦	♦	♦	♦	43	4
<b>TANZANIA</b>	♦	♦	♦	♦	♦♦	♦	♦	♦♦	♦	♦♦	♦	♦	♦♦	♦♦	♦♦	♦	♦	♦	36	5
<b>DJIBOUTI</b>	♦♦	♦	♦	♦	♦♦	♦	♦	♦	♦	♦♦	♦	♦	♦	♦	♦	♦	♦	♦	34	6

### 4.1 KENYA

Numerous live and developing transactions, but government involvement in steamfield development and management could be an issue for future private sector partners. Geothermal is a critical part of the country’s power mix. Continued assistance is critical; as goes Kenya, so goes the region.

#### Summary

With nearly 600MW scheduled to be online by the end of 2014, Kenya is the leader for geothermal development in the region. Its long history of geothermal development and exploration makes many countries—and many donors—look to Kenya as the example for how to tap their geothermal resources.

Nevertheless, Kenya's approach to geothermal development is not without its issues, and should certainly not be taken as a "one size fits all" model for the rest of East Africa that doesn't have the same resource potential or level of technical capacity that was built up over more than 30 years in Kenya.

With the creation of the Kenyan Geothermal Development Company (GDC) five years ago, Kenya took a decisive step toward significant government

involvement in geothermal exploration and drilling. GDC has been drilling the resource at Menengai with the intent of developing and operating the steamfield for 100 MW in three separate plants ((1x30 MW, 2x35MW) developed by three different Independent Power Producers (IPPs). The justification for this approach was that in order to facilitate rapid development of geothermal power, the government would take a proactive role in the riskiest, most capital intensive phase of geothermal project development—exploration and production drilling—leaving plant construction and operation to IPPs. The two partners would split the tariff from the utility Kenya Power and Light Company (KPLC), with GDC taking payment for the steam, and the IPP being paid for generation. In support of this strategy, the Kenyan government and donors have deployed hundreds of millions of dollars to purchase rigs and carry out ambitious drilling programs.

Numerous conversations with geothermal experts, lenders, equity investors, and donors have raised concerns about this approach in terms of its overall efficacy and ultimately, its bankability. Drilling results at Menengai have been lower than expected, prompting questions about the overall drilling plan, the rig tendering process, skills and experience of the drilling crews, and the overall stability and reliability of the steamfield to deliver the steam required to power 100MW. The structure of the project—with three IPPs on one field—has also raised concerns about the bankability of the project. Risk averse lenders are generally reluctant to finance a project that cannot be fully "ring-fenced"—the resource supplying the plant they are financing is completely under the control of the GDC and not the IPPs. With three IPPs sharing one steamfield, it is not possible to ring-fence any part of it for individual IPPs. Donors are working to put in place partial risk guarantees that would guarantee payment for steam production in the event of a problem with the steamfield. While this offers

#### **Risks of Too Much Government Involvement in Geothermal Development**

**Risks associated with the GDC model:** Government development and management of steamfields is very costly and full of risk. It requires a significant commitment in terms of staffing, capacity building, and on-the-job training. If governments are not properly qualified to explore, develop and manage steamfields, projects can face challenges in terms of obtaining project financing, as lenders perceive too much risk in terms of well integrity, steamfield management, and government capacity to guarantee output.

**"If you drill it, they will bid":** A common perception exists among governments and donors that simply drilling a discovery well to prove and de-risk a given resource will lead to a flood of investors bidding on PPP tenders. While this strategy has proven effective in some markets, significant capital and risk remain and very often the issue of the tariff is of greater consequence than the resource risk. The quality and the location of the wells drilled by the government or sub-contractors is also an issue. If drilling is not done properly, or if data is not available/of high quality, developers may not bid, or will bid lower than expected prices.

**Partial Risk Guarantees are not always the answer:** Partial risk guarantees are very useful instruments to mitigate financial risks; however, a partial risk guarantee for a technical issue (e.g., steamfield output) will protect developer downside, but will NOT guarantee MW are delivered to the grid. Simply put, insurance products and guarantees cannot replace solid technical expertise and practices.

downside protection, and may serve to help a project obtain debt financing, a partial risk guarantee of a steamfield does not mitigate the ultimate risk—failure to get MW to the grid.<sup>19</sup>

GDC and its advisors continue to discuss the appropriate role, function, skills, and resources needed to develop the geothermal resources in Kenya. Recognizing that the funding demands cannot sustain the current development model, the GDC is working with Power Africa to craft a Joint Development Agreement that will allow GDC to move forward with private investors. The process to find the right model is iterative, and will need to be developed carefully with input and feedback from the private sector and investors. The structure will also need to incorporate the ultimate goal for GDC to become a profitable and sustainable entity. In the meantime, there are live transactions going forward (both fully private and PPPs), that should also be supported. Other countries should be cautious to simply implement the GDC model, as it is (a) a work in progress, and (b) not ultimately applicable to the context of the other East African countries.

### Key areas for assistance

- Advice and consultation to GDC to determine which development models it can most effectively manage, oversee, and execute.
- Strengthen GDC's internal management system for surface, subsurface, and drilling data collection and analysis, planning and project development to inform current and future drilling programs, and to increase the value of PPP tenders.
- Strengthen GDC's project management system to allow efficient execution of projects
- Assist GDC in developing a coordinated project development plan that will entice engagement of investors and withstand the scrutiny of investor technical, legal and commercial due diligence
- Tendering of drilling rigs with adherence to international standards for quality, safety, health, and environment, and requiring internationally experienced drilling supervisors.
- PPA pricing to reflect project costs. The current FIT is likely economical only for the largest, hottest resources and does not reflect the realities of resources that are a) colder, b) more remote, c) deeper, d) have complex chemistry, or e) are fully developed by the private sector where cross subsidization from different departments and ministries can mask the actual cost to develop a project.
- Structuring of tenders/clarity on development process. Assistance should focus on the legal structure of the tender, ensuring that the tender is offered as “packaged” as possible—the resource field is clearly defined (area, potential, etc.), development rights are clear (surface and subsurface, as well as land rights), data is available in a commonly accepted format, permitting requirements are clear and straightforward, development requirements (technical, timing, and financial) are clear and reasonable, responsibility for transmission and interconnection is clearly delineated, and any financing or risk mitigation facilities are spelled out for the potential IPP. This

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<sup>19</sup> Comment from donor community: An alternative approach to ‘ring fence’ the project would have been to develop the field in three phases by the same developer.

As mentioned above, if Government role was limited to proving the geothermal reservoir with an appropriate flow test, rather than developing the entire field, additional geothermal sites could have been developed in parallel with the same investment/equipment/timeframe, therefore the same amount of power (3x30MW) could have been developed, albeit in three different sites. Subsequent phases would have been developed according to the results of the geothermal numerical models, increasing the likelihood of bankability and documentation. Olkaria III is a good example for the implementation of such strategy.

The Menengai strategy of splitting the resource between three developers and two concurrent contracts, one for steam supply and the other for power offtaking, is a precedent that has not been tested in previous Energy Conversion Agreements. In previous cases, such as in the Philippines and in Guatemala, the off taker and the steam supplier were the same body, simplifying project documentation. This split approach in Kenya is yet to be tested with lenders which will be required to address this new architecture, even if ultimately, both organizations are government owned.

will increase interest from the developer, and likely increase the bid prices submitted for each resource.

### Transactions

Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
Akiira	Akiira Geothermal	140 MW (40 + 100)	<ul style="list-style-type: none"> <li>Up to 140 MW (in 70 MW phases) at resource near Olkaria; development led by Akiira Geothermal.</li> <li>Akiira has secured land and completed the civil works for drilling (well pads, access roads, etc.). The PPA has been signed. Munich Re insurance has been signed and a National Environment Management Authority (NEMA) license has been issued. Akiira has received a \$1.0MM grant from OPIC ACEF program to support development activities, as well as a grant from GRMF for drilling.</li> <li>Drilling will commence in July 2015</li> </ul>	<ul style="list-style-type: none"> <li>Include in forecasting for risk mitigation facility</li> <li>Provide support to resolve GRMF issue (if applicable)</li> <li>Provide ad hoc support to developer as needed</li> </ul>	Live transaction
Baringo-Silali North Rift	TBD	2500 MW, 5 resource blocks  Initial development 200 MW at Silali	<p>GDC is preparing a term sheet for a JDA/PPP to develop this field. It is unclear the role GDC will play in steamfield development, as discussions are still underway</p> <p>GDC is in process of securing exploration drilling services and infrastructure development under KfW funding</p>	<ul style="list-style-type: none"> <li>Power Africa and GreenMax Capital advisors are provide transaction advisory and technical services to GDC to finalize its JDA/PPP approach</li> <li>Provide technical support to GDC in pulling together the requisite documents and information that will be required by JDA partners (project development plan)</li> <li>Provide support to GDC to market its new plan (once developed) to investors and developers</li> <li>Strengthen GDC's internal data, project planning and management systems Strengthen GDC's Project Management system</li> </ul>	6-12 months

Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
Longonot	Agil	140 MW	<ul style="list-style-type: none"> <li>Up to 70MW development led by Agil.</li> <li>Agil has a signed PPA, and had made significant progress in civil works and financing (GRMF award, indicative terms on insurance and financing), but has encountered difficulties with obtaining water, community relations, and investor turnover.</li> </ul>	<ul style="list-style-type: none"> <li>Peer review for drilling plan</li> <li>Assistance obtaining financing for early stage drilling</li> <li>Include in forecasting for risk mitigation facility</li> </ul>	Live transaction
Menengai	Ormat Quantum Sosian	100MW (1 x 30 MW, 2x35MW)	<ul style="list-style-type: none"> <li>Steam supply agreements have been signed. Parliamentary approval will be required to finalize.</li> <li>GDC is currently drilling the field; to-date, 20+ wells have yielded just over 90MW (according to GDC estimates)</li> <li>Legal assistance is being provided to GDC to determine structure and composition of steam supply and off-take agreements</li> <li>AfDB is financing the drilling, providing financing to the IPPs, and providing partial risk guarantees (with the World Bank) for the steam supply (GDC) and off-take (KPLC)</li> <li>GDC has issued notice to proceed to the steamfield EPC contractor</li> </ul>	<ul style="list-style-type: none"> <li>IPPs will likely need assistance with negotiation and structuring, given the unique arrangement of 3 IPPs on one steamfield. Bankability will be a challenge; lenders should be engaged early (if not already engaged)</li> <li>GDC will need support on schedule coordination. The steamfield EPC project will be completed in 5-6 months, likely a minimum of 1.5 years in advance of the power plants. This indicates a need for both planning and project management capacity building needs for GDC.</li> </ul>	6-12 months
Olkaria VI	TBD		<ul style="list-style-type: none"> <li>KenGen has issued 3 separate EOIs for Olkaria VI—Transaction, Financial and Environmental. The EOI has closed, but shortlisted companies have not been announced.</li> </ul>	<ul style="list-style-type: none"> <li>Provide support to KenGen in developing and structuring the PPP transaction and undertaking the procurement</li> <li>Support KenGen in re-issuing an expression of interest for Olkaria VI</li> <li>Consider support to shortlisted companies to prepare commercial and technical bids.</li> </ul>	6-12 months

Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
Olkaria I Rehabilitation	KenGen	45 MW	<ul style="list-style-type: none"> <li>KenGen has completed the feasibility study to rehabilitate this plant. KenGen is developing plans to execute the project</li> </ul>	<ul style="list-style-type: none"> <li>This project is ready for execution and a perfect fit for US EXIM funding. PA should take an active role in assisting KenGen with the necessary transaction support to allow this project to move forward. This is most likely the most near term project available for significant US company involvement</li> </ul>	
Olkaria I-unit 6 and Olkaria V	KenGen	70 MW, 140 MW	<ul style="list-style-type: none"> <li>KenGen is actively completing drilling and preparing necessary funding and OE support</li> </ul>	<ul style="list-style-type: none"> <li>KenGen requested additional funding support for Olkaria I – unit 6</li> </ul>	

## 4.2 ETHIOPIA

*Government reform and capacity building are being driven by the Corbetti transaction; Ethiopia is a potential model for the region.*

### Summary

Having only brought 7MW (5MW currently operating) online in the last 30 years, Ethiopia is thoroughly examining its institutional structures, legal and regulatory frameworks, and human and financial capacity needed to effectively and efficiently develop geothermal power. With projects representing three key models of development (public, private, and PPP), the country with the second highest resource potential in the region is poised to become a laboratory for geothermal development models. The Corbetti project, being developed by Reykjavik Geothermal (RG) is fully private, and the Aluto-Langano is being developed by the government. Two concessions in the Tendaho resource area (Alalobeda and Dubti-Ayrobera) are currently being assisted by ICEIDA and UNEP/ARGeo for conceptual modeling and drilling targeting. The World Bank and AFD are supporting the drilling activities. These fields are under consideration to be tendered as PPPs. There is clear government support for geothermal, as evidenced by the months-long multi-agency effort led by IFC to address major issues, structure, and the way forward for geothermal in Ethiopia.

### Key areas for assistance

- Development of structure within government entities to effectively manage geothermal exploration and development.** This work is underway by the IFC.
- Legal and regulatory framework specifically for geothermal.** This work is underway by IFC but additional assistance will be needed.
- Comprehensive approach to capacity building for government and private sector.** Once IFC work is done, critical gaps will be identified and donors should respond with appropriate assistance to build the governments institutional and project management capacity.
- Data collection and analysis systems.** Many surface and subsurface studies have been completed or are in progress. GSE has developed a geothermal database. This database needs to be enhanced and new data to be collected in a format that is easily accessible by developers, research institutions, the government, etc. Proper collection and management of high quality data will lead to better tenders under the PPP model currently contemplated for Alalobeda.

### Transactions

Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
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Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
Corbett	Reykjavik Geothermal	up to 1,000 MW	<ul style="list-style-type: none"> <li>Reykjavik Geothermal is negotiating first phase of the 1000 MW project (500 MW) with EEP to be developed in phases starting with 20 MW.</li> </ul>	<ul style="list-style-type: none"> <li>Continuation of current efforts; PPA negotiations, permitting, and other contractual negotiations and procurements will provide guidance for subsequent transactions</li> </ul>	Live transaction
Tendaho/ Dubti-Ayrobera (AFD)	TBD	TBD	<ul style="list-style-type: none"> <li>UNEP ARGeo has supported in developing conceptual model and locating the best sites for deep drilling.</li> <li>AFD supporting drilling of shallow and deep resources at Tendaho and refurbishing two drilling rigs owned by GSE</li> </ul>	<ul style="list-style-type: none"> <li>Work with EEP to develop high quality tender documents; including adherence to international procurement, health, safety, and environmental standards</li> <li>Ensure high quality data is collected and provided</li> <li>Work to recruit private sector bidders early on in the process (including informing potential bidders of grants, insurance, financing that may be available)</li> <li>Include in forecasting for risk mitigation facility</li> </ul>	1-2 years
Tendaho/ Alalobeda (World Bank)	TBD	TBD	<ul style="list-style-type: none"> <li>ICEIDA is currently supporting conceptual modeling of the Alalobeda area</li> <li>The World Bank is funding for drilling of up to four reservoir confirmation wells at Alalobeda</li> </ul>	<ul style="list-style-type: none"> <li>Work with EEP to develop high quality tender documents including adherence to international procurement, health, safety, and environmental standards</li> <li>Ensure high quality data is collected and provided</li> <li>Work to recruit private sector bidders early on in the process (including informing potential bidders of grants, insurance, financing that may be available)</li> <li>Include in forecasting for risk mitigation facility</li> </ul>	1-2 years

### 4.3 RWANDA

*The business climate, power price, and government approach is ripe for private sector development, but resources may not be commercial*

#### Summary

Geothermal development in Rwanda is in the early stages. After a disappointing drilling campaign at Karisimbi, donors and the government have shifted their focus from drilling to surface and subsurface studies to better characterize the resources in the country. Both JICA and ISOR carried out surface studies in Rwanda (and JICA has analyzed all the surface and subsurface work done to-date in the country), and both concluded that there are likely commercially-viable resources in the country. The reports prioritized different resources, however.

A peer review of these studies is needed to determine which resource(s) is/are most likely to be commercially viable, and determine the best path forward for exploration. In addition, policy work on tariffs, tax incentives, insurance, financing, etc. is needed as incentives for private investors to enter the market. Should utility scale power generation not be viable, Rwanda should look at direct use applications, assuming resources are close enough to commercial activity.

#### Key areas for assistance

- Peer review of JICA and ISOR studies to help prioritize resources and chart path forward.

- Fast track assistance to develop the enabling environment for private sector development.

## Transactions

None at this time.

## 4.4 UGANDA

*Human capacity is strong, the policy environment is progressing, and private developers are active; the overall environment for the private sector (particularly foreign companies) is not favorable*

### Summary

Geothermal development in Uganda is still in the very early stages, and is focused on surface and subsurface studies, which are being carried out by the government, donors, and the private sector. The legal and regulatory environment for geothermal is currently governed by the Mining Act, which is inadequate for geothermal, particularly in terms of the time allowed for exploration, due diligence requirements, and the process for private sector developers to sell steam.

For private sector developers, Uganda is a difficult environment in terms of general rule of law and contract sanctity. For American companies governed by the Foreign Corrupt Practices Act (FCPA), the environment is particularly challenging. Good governance in Uganda needs to be in place in order for developers to feel comfortable taking on the technical and financial risks inherent in geothermal development. In spite of the unfavorable macro environment, there are a number of private developers in Uganda at various stages of development, including one that has signed a PPA.

Human capacity within the government to govern and carry out the development of geothermal is growing for early stage exploration and development. Some gaps exist in terms of geophysical expertise and experience, as well as general on the job experience in all areas of exploration-surface as well as subsurface. Drilling experience relative to both actual drilling as well as regulating drilling is minimal.

### Key areas for assistance

- Assistance to newly created geothermal department to determine structure and build technical and administrative capacity. The World Bank is currently designing a project to this effect.
- Assistance with drafting geothermal law. The World Bank project also focuses on this. Future assistance on key implementing regulations, permitting processes, etc., may be necessary in the near future.
- Completion of surface and subsurface exploration, complete with robust data collection and analysis and making such information available to potential private developers and financiers.<sup>20</sup>
- Capacity building in conducting geophysical surveys and interpretation of results. The government is looking to procure equipment to conduct geophysical surveys, and will need training to carry out the surveys, collect, analyze, and interpret the data.<sup>21</sup>

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<sup>20</sup> UNEP ARGeo program has assisted the GoU to identify the gaps in surface exploration studies and develop a conceptual model for the Kibiro geothermal prospect area.

<sup>21</sup> Cooperation and training is on-going with GDC. Further training through a potential regional center of excellence is also envisioned. Additional assistance from international technical experts is recommended.

## Transactions

Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
Uganda	Kasese (AAE)	Up to 150MW	<ul style="list-style-type: none"> <li>Pre-feasibility study has been completed on an adjacent resource (shallow wells only).</li> <li>AAE has obtained a PPA from ERA.</li> <li>AAE successfully transferred license from local partner to US entity.</li> <li>Developer has been warned it may soon have its concession revoked for lack of progress</li> </ul>	<ul style="list-style-type: none"> <li>Assistance navigating concession development process in Uganda</li> <li>Technical assistance on development plan</li> <li>Assistance applying for and obtaining funds available for early exploration (ACEF, GRMF, etc.)</li> </ul>	Live transaction
Uganda	Pawakom, Cozumel, etc.		<ul style="list-style-type: none"> <li>Early stage development</li> </ul>	<ul style="list-style-type: none"> <li>See above</li> </ul>	Live transaction

## 4.5 TANZANIA

*Geothermal development is at a crossroads. Policies and priorities are unclear and confusing. The creation of TGDC represents a critical juncture for geothermal. Discrete opportunities exist.*

The Government of Tanzania (GoT) has made a strong commitment to addressing the critical power shortage within the country, focusing on gas, followed by coal, hydropower, and then renewable energy (including geothermal). As such, it is unclear that geothermal energy is a true priority. Discussions with officials at the Ministry of Energy and Minerals (MEM) however, indicate that geothermal is, in fact, a priority, with both the Minister and the Permanent Secretary openly stating that they would like to see geothermal exploratory drilling start within the next 12 months. Furthermore, GoT recently created the Tanzanian Geothermal Development Corporation (TGDC), which will be in charge of geothermal development in the country, and hosted the biennial ARGeo conference in Arusha, Tanzania.

While these actions are promising in terms of demonstrating commitment to geothermal, there is currently no regulatory framework for geothermal development, and GoT seems to want to wait until the geothermal policy is fully developed before revisiting the concession tendering process (to be developed after both the new energy law and the renewable energy act are in place). Private development has been halted due to the revocation of all private concessions. GoT has indicated that it intends to develop TGDC in the model of GDC in Kenya.<sup>22</sup> This would be inappropriate, given the smaller geothermal potential in Tanzania (and the general issues with government involvement in steamfield development stated above in the Kenya section). Developing an organization with the size and scope of GDC in a country with 10% of the resource potential has the potential to be a waste of resources both financial and human.

Donor assistance is currently led by AfDB (through the Scaling Up Renewable Energy Program (SREP)), which is set to provide technical assistance for policy development and capacity building for the relevant institutions focused on geothermal exploration, development and regulation. Further, up to \$25 million is available for subsurface studies and exploration drilling. An additional \$30 million will be reserved for financing geothermal projects in the future. Assistance from the EAGER project

<sup>22</sup> Data Collection Survey on Geothermal Energy Development in East Africa. JICA. January 2014.

(DFID) may be forthcoming for TGDC. In addition, the World Bank (through ESMAP) is exploring assistance on project preparation for TGDC (environmental impact assessments, etc.).

Other donors are taking a wait and see approach to their activities in geothermal, preferring to let the AfDB better define and carry out their program before determining where they can best provide additional assistance and financing. The donor community would like to know more about and have an opportunity to coordinate more closely with the AfDB in developing its program, so that the program may fully benefit from the work by other donors (namely JICA and BGR) done to-date.

Tanzania is at a crossroads. If GoT opts to stop all development until policies are in place, and forms TGDC in the model of Kenya's GDC, it is likely that geothermal development in the country will be delayed for many years. Donor assistance to work with GoT on structure and policies, combined with transaction assistance to the current developer active in the country could help avoid these delays and get geothermal MW to the grid much more quickly.

### Key areas for assistance

- Policy development—in coordination with the AfDB program under SREP, work with MEM to develop a legal and regulatory framework for geothermal. Emphasis should be on the concession tendering process and concession provisions, in order to resolve the outstanding issues with private developers, and demonstrate that Tanzania is committed to private sector involvement in geothermal development.
- Assistance to TGDC—in parallel with the policy development efforts, a key focus for donors should be TGDC. It is critical that TGDC develop a proper structure and identify its core functions up front, so that the appropriate capacity building efforts can be undertaken, and the private sector can understand the opportunities available, and the role that the government will play in development.
- Coordination with AfDB to leverage JICA and BGR surface and subsurface work for its program to provide policy assistance and drilling funds to Tanzania. Significant work remains to be done prior to deep exploration drilling.

### Transactions

None at this time.

## 4.6 DJIBOUTI

*The country has a history of private sector interest, and is a strategic priority due to its location in the region. Recently, the Office for Development of Geothermal Energy (Djibouti) (ODDEG) was installed under the Office of the President and given the responsibility for carrying out geothermal development and project management for the country. A recently-passed IPP law will serve as a key piece of legislation driving the enabling environment. In order to encourage private sector development (as the Government has indicated it supports), an improved enabling environment, a reasonable tariff, and clear political will are needed.*

### Summary

Numerous efforts to develop geothermal in Djibouti have been made over the last 45 years, primarily led by donors. As a result, significant data on the geothermal resources (particularly at Lake Assal/Lava Lake) exist, which would seem to indicate that Djibouti is ripe for the development of a geothermal power plant. Previous private sector development stalled at various stages due to a) the 2008 financial crisis (Icelandic investor), and b) belief that the capital requirements to mitigate the high salinity of the geothermal brine would be uneconomical (recent technological advances have helped to bring costs down).



The Government of Djibouti (GoDj) seems to be highly supportive of geothermal, having installed ODDEG directly under the Office of the President. However, early indications on acceptable (to GoDj) tariff levels (particularly when compared to anticipated low prices coming from Ethiopian hydropower) indicate that further challenges lie ahead to pave the way for private sector development.

In May of 2013, a consortium of donors led by the World Bank approved a projected to drill exploratory wells at Lake Assal, and to prepare a feasibility study for a potential tender of a concession to an IPP to carry out the remaining drilling, construction, and operation of a ~50MW plant. This project has been delayed for various reasons (turnover within donor organizations, lack of clear responsibility within the Government of Djibouti, etc.), but has been restructured. The bank has issued a tender for a company to oversee the drilling and implementation of the program (should be in place in September 2015), and the Government of Djibouti has established and assigned key staff to a Project Implementation Unit (PIU). The geothermal consulting company (GCC) should be on board by August, along with an international project director and environmental and social experts.

USAID/Power Africa have assigned a transaction advisor to coordinate with the World Bank team to drive the project toward an IPP tender. The transaction advisor, in cooperation with the Power Africa geothermal team, will work to advance the Lake Assal Project and North Ghoubbet, as appropriate. EAGP will provide training in key technical areas to build government capacity.

### Key areas for assistance

- Technical assistance to develop legal and regulatory framework for geothermal (through IPP law).
- Technical assistance and coordination with World Bank program to develop and manage tender process (and apply this work to other concessions, such as North Ghoubbet).
- Capacity building for ODDEG.
- Completion of surface and subsurface exploration, complete with robust data collection and analysis to be made available to potential private developers and financiers.

### Transactions

Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
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Transaction	Developer	Size	Progress	Transaction support needed	Lead Time
Lake Assal/ Fiale Caldera	TBD— currently donor/ government led early exploration	50MW	<ul style="list-style-type: none"> <li>Potential IPP tender after initial drilling carried out by World Bank consortium; project signed in late 2013, but still awaiting implementation</li> </ul>	<ul style="list-style-type: none"> <li>Work with World Bank's PIU and other government agencies to clearly define the concession tender and development process (in coordination with the development of the implementing regulations of the IPP law)</li> <li>Work with government/donors to develop high quality tender documents including adherence to international procurement, health, safety, and environmental standards</li> <li>Ensure high quality data is collected and provided</li> <li>Work to recruit private sector bidders early on in the process (including informing potential bidders of grants, insurance, financing that may be available); early involvement can help to accelerate policy development and reform</li> <li>Include in forecasting for risk mitigation facility</li> </ul>	2+ years
North Ghoubbet	TBD	50MW	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Apply lessons and tools developed from Lake Assal to North Ghoubbet transaction</li> </ul>	2+ years

## 5 OPPORTUNITIES FOR GEOTHERMAL DEVELOPMENT—REGIONAL RECOMMENDATIONS

While the main thrust of this strategy is transaction focused, there are some key interventions at a regional level that will help lay the groundwork for future project development in the region.

### 1. Risk Mitigation/Financing Facility

It is widely recognized that the exploration phase for geothermal (from surface studies to production drilling) is both expensive and risky. To help mitigate the risk to private (and public) developers, a number of initiatives have been put in place by donors, and governments have in some cases taken it upon themselves to carry out exploration up to and including production drilling. As outlined in the chart below, the facilities available primarily cover the earliest exploration costs—from surface studies through exploration drilling. For private developers, there are currently no facilities available to mitigate the risk of production drilling (an insurance product from a private underwriter is in the design and funding phase, but is not yet in place, and may not adequately cover drilling risk such that developers will be able to obtain additional investor capital or project financing). This phase of development can often consume 40-50% of project costs, and represents the final hurdle (in terms of resource development) to obtaining project financing. When speaking with developers, lenders, and equity providers, all identified the gap in financing/risk mitigation as a key barrier to bringing geothermal development projects online.

A second key barrier for private developers to bringing projects on line without significant delays is the need to procure long-lead items (turbines, wellheads, casing, etc.) such that projects are not delayed while waiting for financial close. A facility that to provide this financing (or provide a guarantee) would help mitigate significant project delays.

The structure of a potential risk mitigation facility will depend on project pipeline (determines size, ability to spread risk), donors (size, structuring to meet donor requirements), interest/strength of private financial institutions (pricing, structuring), and developer ability to match leverage requirements. Ideally, some form of private debt financing would be available for production drilling, but the overall risk of production drilling and the lack of project pipeline to diversify risk make it unlikely that an appropriately priced product could be structured without some form of donor guarantee/backing and/or insurance.

Program	Description	Surface exploration	Exploration Drilling	Production drilling	Construction	Operations	Transaction costs	Pros	Cons
UNEP/ ICEIDA	Funding and technical assistance for surface exploration	X						•Means to identify high priority projects for further exploration	•None
GRMF	Grant facility to fund early surface and some exploration drilling costs	X	X					•Available to public or private •Many uses	•Annual application cycle •Small facility
ACEF, ALSF	Grant facility to fund early development and transaction costs	X				X		•Mitigates transaction risk •Flexible application	•ACEF limited to US service providers •Small grants
Drilling Insurance: Munich Re	Insurance product for earliest (exploration) drilling risk		X					•Partially insures riskiest wells	•High premium costs •Does not cover production drilling •Does not address capital needs
Drilling Insurance: Parhelion (tentative)	<i>Insurance product to cover some production drilling</i>			X				•Partially mitigates production drilling risk	<i>•Still considerable risk remaining •High premium costs •Does not address capital needs</i>
Project Financing	Traditional debt from donors or private lenders				X	X	X	•Low cost capital to bring projects to COD	•Only available after majority of risk mitigated
Private Insurance	Traditional insurance required by project lenders				X	X		•Protection against project delays, performance issues, force majeure	•Only available after majority of risk mitigated
Risk Guarantees	Facilities to mitigate political, performance risk				X	X		•Protection against political, off-take risk etc.	•Mostly available after majority of risk mitigated

## 2. Development of standard geothermal act and policies<sup>23</sup>

Country assessments revealed numerous gaps in policy development, even in the countries with the most advanced geothermal programs. Key gaps identified include:

- Lack of a geothermal specific law or act.
- Unclear structure and function of agencies,
- Lack of clarity for concession tendering process and development requirements.

<sup>23</sup> Since the initial report was written, a number of donors have begun working in this space. For example:

- In Ethiopia, the IFC has led a comprehensive exercise with the Government of Ethiopia to determine the best government structure to manage geothermal resources, and has identified and begun work on key policy and legal needs, such as the drafting of a geothermal law, concession processes, etc. This work is also supported by Power Africa (through EAGP).
- DFID has awarded a contract for a regional facility to provide targeted technical assistance to governments in several of key areas.

- Rig tendering not adhering to internationally accepted practices and standards.

### **3. Data collection<sup>24</sup>**

Collection of high quality data in a standardized format is critical at every phase of geothermal power development, construction, and operations. Without robust data, it is impossible to determine the characteristics of a resource, target production wells, learn from drilling errors, track construction expenses, and monitor steamfield performance, among others.

Data collection was identified as a weakness in every country in this strategy. The ARGeo program has developed a Geothermal Inventory Database (AGID) that has information on projects, sites, stakeholders, manpower, equipment, laboratories, reports, maps, etc. AGID has emphasized the importance of geothermal related data and information collection, and has compiled a database of reports on different resources, but is not clearing house for raw data (nor should it be). A more comprehensive study of data collection practices in each country is needed, and should be combined with recommendations for the ideal way to collect and store data, including how it should be presented, common software needed, etc.

### **4. Regional Geothermal Association**

Geothermal energy development is of relatively high priority in all of the countries covered in this study. It is of equally high priority for donors, as reflected by the numerous technical assistance activities and financing initiatives throughout the region. There is a need to capture the results of these activities, disseminate lessons learned, and maintain momentum and interest in geothermal should government or donor priorities changes into the future. A regional geothermal association—initially funded by donors, but with a clear path toward sustainability—could serve this purpose. Indeed, a regional geothermal association could:

- Identify trends across countries and convene donors, governments, and the private sector to develop solutions to key issues, share innovations, etc.
- Provide guidance to donors, governments, and the private sector on best approaches to geothermal development
- Preserve and disseminate institutional knowledge: Serve as a repository for information, studies, training materials, reports, etc.
- Provide or coordinate training on important geothermal topics
- Provide assistance/guidance to country-level geothermal associations
- Serve as institutional home and convening body for regional geothermal development strategy

Members could include government officials working in geothermal power (or renewable energy), donors, private sector developers and service providers, investors, lenders, and other providers of capital for geothermal. The association would become self-sustaining through membership dues, and fees charged for services (training, data storage, etc.).

Surveys from 3 of 6 countries in this study (Rwanda, Uganda, and Ethiopia) showed broad based support from governments, donors, and the private sector for a regional geothermal association. 94% of respondents (32 out of 34) indicated strong or very strong interest in such an organization.

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<sup>24</sup> Power Africa (via EAGP) has been working on data assessments in Ethiopia and Djibouti, and should have preliminary reports completed in 2H 2015. One donor noted that there is a need to focus on raw data collection, as well as a more coordinated effort among donors could/should address (i) who will benefit from the data, (ii) what kind of data is required, (iii) are developers willing to provide such data (to potential competitors, (iv) cost of database for raw data (running and to set it up), (v) sustainability.



The East Africa Regional branch of the International Geothermal Association (IGA) has already been established, a board created, and bylaws adopted. This association was established with the assistance of UNEP and is currently working with the UNEP ARGeo program. The regional branch already has members from a number of countries in the region. Having the basic infrastructure in place and the initial name recognition in the region, it would be the logical target for donor assistance to create and implement a business plan, provide funding for staff and technology, and general assistance to build out capacity.

## 5. Regional Capacity Building

Numerous donors are engaged in capacity building for geothermal development. While this is the area with the most technical assistance provided, it is also the least coordinated, and the most in need of a comprehensive approach. In numerous interviews and stakeholder discussions, concern over the ad hoc approach to training and capacity building was expressed. Because workshops and trainings are relatively low cost, and have very short lead times for implementation, the region has seen a proliferation of workshops on a variety of topics. There tends to be overlap in workshop topics and inconsistency in attendees. A more comprehensive approach to identifying skill gaps/needs, determining the appropriate timing, and developing a common curriculum/approach to training would help improve the return on donor funds dedicated to training and capacity building. Such an approach should be sure to coordinate and leverage the already existing initiatives such as the African Geothermal Center of Excellence (led by GDC in Kenya), the UNU-GTP program, JICA's training efforts, etc.



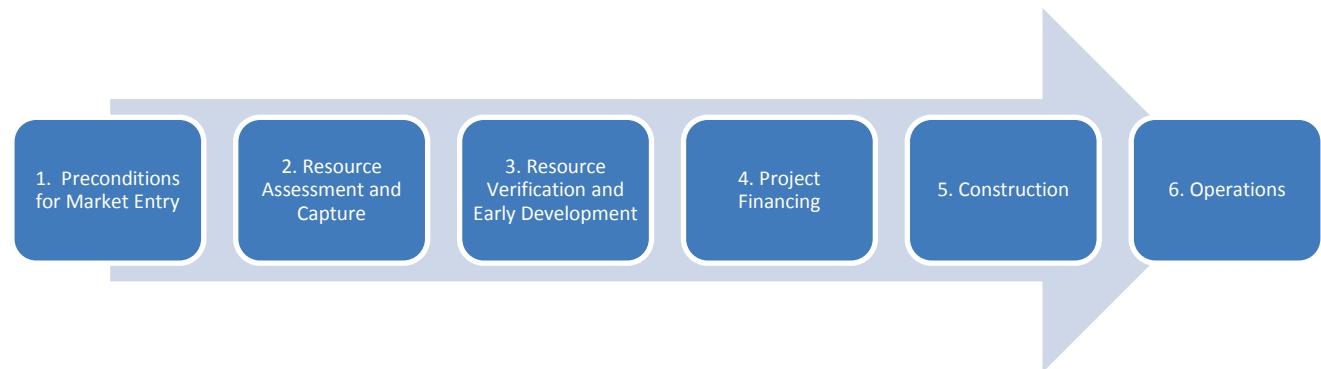
## APPENDICES

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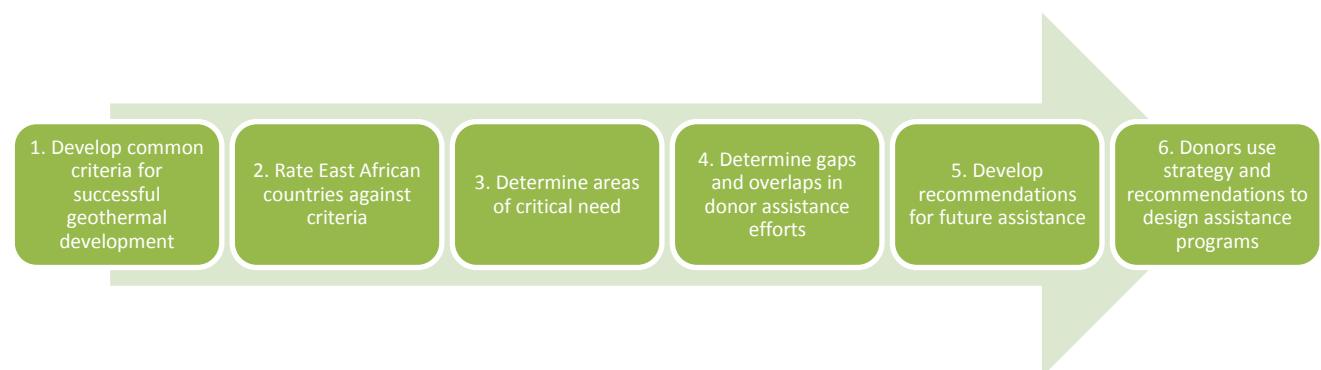
## APPENDIX A: METHODOLOGY

### 1 FRAMEWORK FOR STRATEGY DEVELOPMENT

The framework for the development of the strategy is based on a set of common criteria for successful geothermal development along the chronology for bringing a project on-line:



Each country was assessed on their progress against these criteria to determine the areas of most critical need. Current and planned donor activities (financing, risk guarantees, technical assistance, etc.) were then mapped against the criteria to determine which areas of need are being covered, where there are assistance gaps, and where there is overlap requiring better donor coordination. The results of this analysis were used to develop recommendations for the donor community to implement on a country by country and regional basis.



The strategy focuses on those areas that are most critical for promoting the development of geothermal power plants, with an emphasis on bringing private developers and lenders into the space. Key focus areas include the legal and regulatory environment (legal framework, permitting, and contract sanctity), tariff regimes, creditworthiness and capacity of off-takers and steam suppliers (as applicable), risk mitigation mechanisms (guarantees, grants and insurance, etc.) and tax structure and tax incentives.

The development of the strategy was done through a coordinated effort, bringing together members of the East Africa donor community (AFD, AfDB, BTC, BGR, DFID, EIB, EU, ICEIDA, IFC, JICA, KfW, UNEP, USAID/Power Africa, World Bank), East African government agencies, private developers, and private lenders. Nearly 200 different practitioners representing the entities above have been interviewed as part of this effort.

## 2 FRAMEWORK FOR USE BY DONORS

Use of the strategy begins with review the “snapshot” for each country (see Appendix F). This document provides a quick look at 1) a country’s performance by indicator (low/medium/high), 2) which donors have programs addressing that indicator, and 3) the priority of a particular indicator in terms of critical need (red/yellow green). Combined, these metrics give donors (or other stakeholders) a high level view of where the most critical gaps lie in terms of providing assistance to a given country (and can also highlight where donor coordination may be needed).

Using this snapshot as a guide, users can then obtain more detail by reviewing the country frameworks, which provide more detail by indicator, as well as a summary of the status of geothermal development and key priorities for assistance. In addition, users can also refer to the donor activity database for more detail on the specific activities by indicator.

## 3 FRAMEWORK AS A LIVING DOCUMENT

It is important to note that this report and its attachments represent a moment in time for each country (and the region) in terms of geothermal development. Donor programs will change, countries will develop new policies, and priorities for assistance may change accordingly. As such, it is critical that this strategy remain a “living” document that is updated at regular intervals. Given the level of activity in the region, it is recommended that the supporting data be updated every 6 months through stakeholder consultations, surveys, etc. Initially, this work can be carried out by a PowerAfrica representative. For the strategy to truly gain traction and be used as a tool for stakeholders going forward, it needs a more permanent home. In the recommendations in Section 10 below, the report outlines a concept for a regional geothermal association. This would be the likely entity to maintain and update the strategy and ensure it maintains its use to donors and other stakeholders going forward.

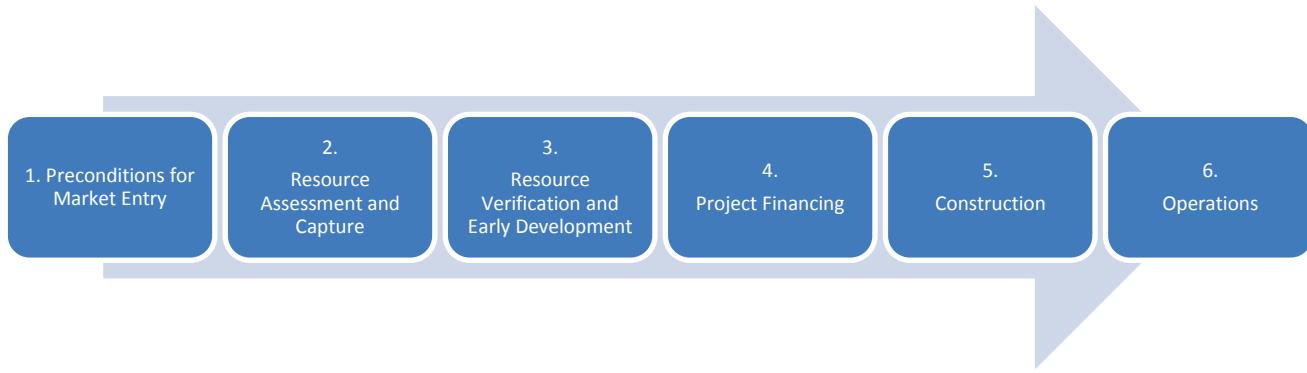
## 4 REGIONAL AND COUNTRY STRATEGY DEVELOPMENT

The results of the framework exercise have been consolidated into this strategy document, which presents the key priorities for geothermal development on a country by country and regional basis. The strategy leverages the work already done by various donors to maintain the collaborative nature of the process, and maximize the impact of the donor funded initiatives. As this is intended to be a living document, in a few cases, country-specific recommendations are vague, as significant work is being done by other donors to determine the most logical next steps. In the next update, much of this work will be complete, and more defined interventions may be possible.

While PA is currently leading the way in this effort, a key element of this process is to work with the existing regional bodies in Africa to house the strategy with one of them (or another regional body as appropriate). This entity would become the “go-to” organization for government agencies, donors, developers, private lenders, and others looking to work in the geothermal space. The “Recommendations” section below outlines options in greater detail.

# APPENDIX B: ENABLING ENVIRONMENT FOR GEOTHERMAL DEVELOPMENT

## 1 PHASES OF GEOTHERMAL DEVELOPMENT



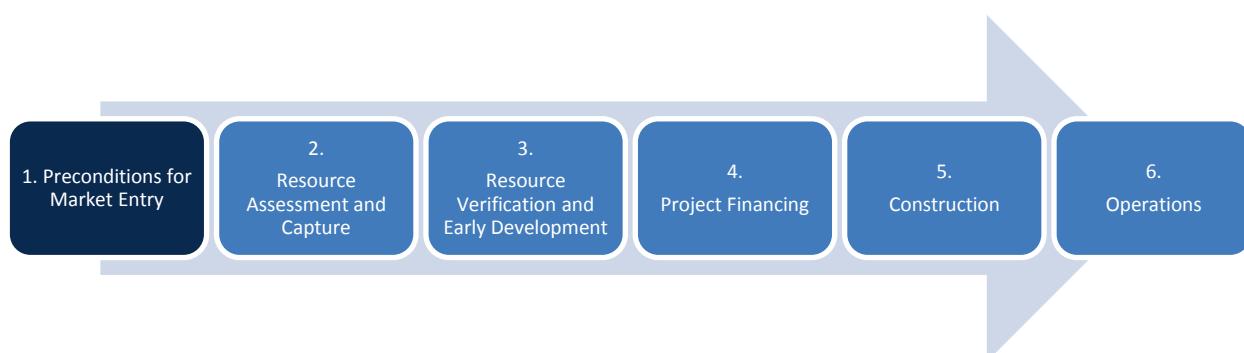
1. **Preconditions for Market Entry:** The decision to enter a country for the purpose of developing geothermal depends on a number of factors, including availability of large, high temperature resources to which access can be secured, a favorable tariff regime (Feed-in tariff, strong market prices, or other incentives for renewables), and proximity to key infrastructure and transmission. Basic sanctity of contracts and/or appropriate risk mitigation mechanisms should also be in place. Additional requirements include basic macroeconomic stability, clear import/export processes, clear taxations regimes, etc. For the purposes of this report and the subsequent strategy, only those criteria that can be directly impacted by stakeholders in the geothermal space will be analyzed.
2. **Resource Assessment and Capture:** This phase consists of obtaining the concession or license to explore the resource, early surface and subsurface exploration (geologic, geochemical and geophysical studies) to determine the characteristics of the underlying reservoir, and preparation for deep hole (exploration and reservoir confirmation drilling). The activities carried out during this stage are intended to “de-risk” the resource by providing insight into the reservoir characteristics, developing robust conceptual reservoir models, and helping to pinpoint drilling sites and targets. Activities are generally lower cost, with total costs for this phase typically on the order of 5-10% of total project costs, depending on how much subsurface exploration (slim holes) is carried out.
3. **Resource Verification and Early Development:** During this phase, exploratory and reservoir confirmation drilling and early plant design take place. The resource is more closely defined (temperature, pressure and chemistry), the megawatts (MW) potential behind the wellhead become more certain, and developers move toward securing financing (or governments look to issue tenders for independent power producers (IPPs) to carry out well field development and design and construct power plants to take the steam. This phase is the highest risk, with up to 40-50% of the total capital required to find a fuel source under the ground. While significant surface and subsurface studies can provide insight into the reservoir, ultimately, there is still significant information unknown.
4. **Project Financing:** For private sector-led projects (greenfield or PPP) that do not use balance sheet financing, project financing (commercial bank or multi-lateral debt) is typically introduced at or near the completion of production and injection well drilling. Lenders have different criteria for when they will consider providing debt to a project, with proven

resource requirements ranging from 70-100% of the proposed plant size. While every aspect of a project will be reviewed, examined, tested, and challenged by project lenders, one of the most critical elements at this stage is the Power Purchase Agreement (PPA), and the credit worthiness of the offtaker serving as the counter party to the developer.

5. **Construction:** The close of project finance typically triggers the “notice to proceed” on construction of the power plant. Typically done through an Engineer-Procure-Construct (EPC) contract, much design and permitting work will have been completed in earlier phases, such that groundbreaking can occur almost immediately after the close of financing. At this stage, it is most critical for the plant to be constructed in a safely and on-time manner, avoiding delays and cost overruns, which can dramatically effect project returns.
6. **Operations:** Upon completion of the plant, commercial operation will be declared, and the plant will begin selling electricity into the grid. At this stage, the operator will be responsible for operating and maintaining the plant, ensuring that it is delivering power per the requirements of the PPA. At this stage, it is critical that major disruptions are avoided, and those that are necessary are planned for and carried out as efficiently and safely as possible. Proactive steamfield management and plant maintenance will help avoid major outages, and—in a worst case scenario—default on a PPA for lack of steam supply.

## 2 COMMON CRITERIA FOR GEOTHERMAL DEVELOPMENT (BY PHASE)

Based on analysis of 1) successful (New Zealand, Iceland, Philippines, and the United States) models for large scale geothermal development , 2) lessons learned from countries that have been less successful at getting significant megawatts on-line, and 3) the author’s experience as a geothermal developer, key criteria for each phase of development are outlined below. The criteria do not assume a particular model for development (state-led, public/private partnership, private sector, etc.), but rather look at the overall enabling environment for developing geothermal regardless of the model(s) in a given country. While the phases and criteria are model agnostic, there are certain criteria (particularly those related to project financing) that presume some level of private sector involvement.



### 1. Preconditions for Market Entry

**1.1 Government support—Legal/Policy:** At this stage, one would expect to see strong awareness of geothermal benefits and clear public support for its development. Countries should have clear policies in place supporting geothermal / renewables. A clear and enforceable law governing geothermal energy sector, along with processes, procedures, and legal precedents should be in place. Key milestones countries should put in place at this stage include (Note: This strategy assumes that it has already been determined that geothermal resources sufficient for utility scale development exist in the country.)

- national geothermal sources are clearly targeted for development, legal mandates for use have been established;
- geothermal law that comprehensively sets forth the conditions of entry for private sector entities (for any model other than full public sector development).
- procurement law (for tendering concessions)suitable for private development or public private partnerships and projects are awarded on a clear combination of technical and qualitative grounds;
- clear division of regulatory functions and roles between the different institutions that make up the energy sector;
- targeted tax breaks and other suitable incentives are in place, applicable to geothermal power projects;
- land rights and (if applicable) a resettlement policy framework has been put in place, including a standard methodology for compensation to displace peoples;

**1.2 Government Support—Tariff Regime:** Feed-in Tariffs are sufficient to generate market returns for investors. There is a range of tariffs available for different size resources, as well as more remote resources. If no FiT, process for negotiating and securing bankable PPA is clear and established.

- The tariff regime should recognize the different economic and financial return profiles of smaller and larger resources, as well as those resources in remote environments, far from transmission, etc., and adjust the tariff or regulatory incentives. The regulator and offtaker should have capacity to analyze, negotiate, and set cost reflective tariffs on a project by project basis, such that investors and developers are confident they will be able to realize a financial return.
- A FiT is not necessary if the process for negotiating a tariff is clear, and if there is precedent for tariffs sufficiently high to provide a reasonable return. FiTs can be difficult to set for geothermal, as the uniqueness of each resource in terms of size, location, etc. can vary widely.

**1.3 Contract Sanctity:** Clear, enforceable investor protection law and dispute resolution provisions in place. (Note: The strategy does not provide recommendations to improve the macroeconomic environment for doing business in the country, which is outside the scope of a geothermal strategy.)

**1.3 a Risk mitigation for business and contract risks:** Guarantees available for off-take risk. A comprehensive suite of risk mitigation facilities is in place, including partial risk guarantees, appropriate insurance products, and/or government guarantees



## 2. Resource Assessment

**2.1 Surface and subsurface data:** Robust data exists for publicly explored fields and is appropriately managed and accessible to provide relevant inputs for private developers wishing to access the data.

Robust data is essential throughout the geothermal development process and in particular in the early exploration phases. This data is used to develop initial reservoir conceptual models, estimate the size and, shape of the reservoir, predict chemistry, pressure and temperature available within the reservoir and, establish drilling sites and targets, as well as the development of drilling and well testing plans.

It is not necessary for a government to obtain this information on its own; in fact, most developers prefer to carry out the data collection and interpretation for themselves. In this case, it is critical for the legal environment to outline a clear permitting process for the early surface and subsurface exploration.

In the case where the government is conducting the surface and subsurface exploration, the data collected must meet international standards for collection, analysis and interpretation, should be stored in a format most widely used and accepted by the industry, such that potential developers, can easily download, interpret, and use the data carrying out further development activities.

Key surface and subsurface activities include:

- Surface mapping
- Geochemistry to understand type of system, as well as the potential temperature at depth and potential for scaling or corrosion problems (sampled from naturally occurring thermal features)
- Geophysical surveys to understand shape and size of anomaly
- Shallow drilling to sample temperature profile

**2.2 Legal framework for concession and development rights:** Clear process to obtain and develop concessions, which adheres to international standards and is based on developer qualifications, financial capability and price offered, exists. Surface and subsurface rights are clear, and process covers all key facets of development.

- Developers, service, and equipment providers should all be in compliance with internationally accepted standards for health, safety, environment, quality, and risk. Adherence to these requirements can be expensive, and therefore compliant developers will almost always be more expensive than those who do not comply. While the short term savings from hiring non-compliant companies can be significant, in the long run, significant problems (well blowouts, casing collapses, injuries, etc.) can occur when best practices are not followed.

- Furthermore, lenders will expect, and in most cases require, compliance with international standards as a condition precedent to financing.
- Clarity on land rights is established in the law. A transparent and equitable process is in place which establishes the priority of the geothermal projects to the development of the country and extent to which government provides assistance in land acquisition and assist with community relations and negotiations with local communities.

**2.3 Technical knowledge in government agencies:** Government agencies have staff with a sound understanding of the requirements of geothermal exploration and development and ideally with prior experience. Experience and expertise required will vary based on the role of the government in geothermal development.

**2.4 Strength/capacity of regulator:** Designated industry regulator is staffed with competent and experienced professionals with a clear understanding of geothermal development issues, has a clear legal mandate, and is an independent body.



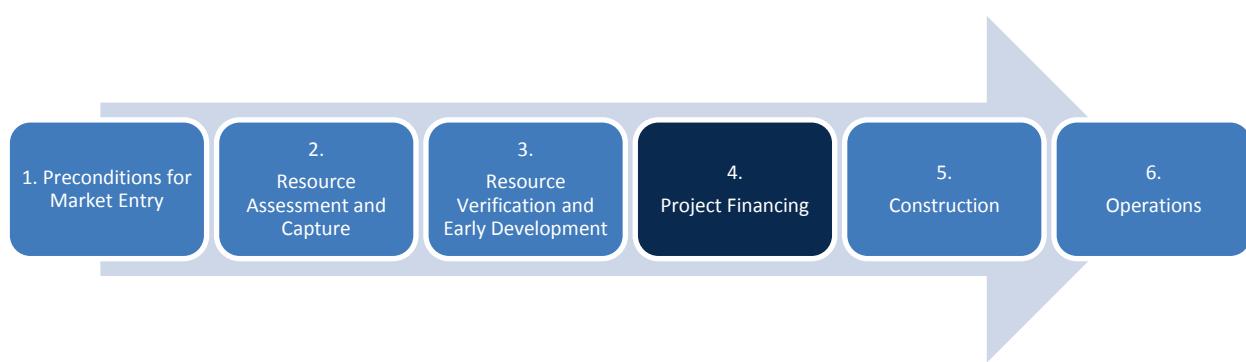
### 3. Resource Verification

**3.1 Access to finance and risk mitigation products:** Financial instruments (e.g., capital/loans/grants) are readily available for drilling and easily accessible to potential developers from both donors and (increasingly) private sector.

**3.2 Access to drilling rigs, ancillary services:** Rigs and services exist in local market or are easy and efficient to procure and/or import. Drilling rules and regulation are in place: Safety, health and environmental requirements are clearly laid out.

**3.3 Clear permitting process:** Process to obtain drilling permits is clear and simple

**3.4 Human capital—resource development:** Individuals responsible for managing development risk have credible expertise and past experience with geothermal development. Experience and expertise required will vary based on the role of the government in geothermal development.



#### 4. Project Financing

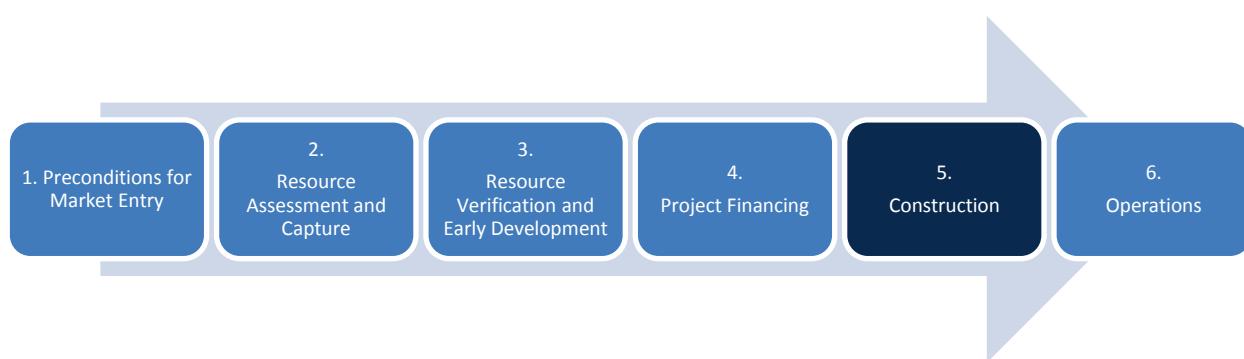
**4.1 Creditworthy off-taker:** Off-taker has investment grade credit rating, track record of making payments, or risk mitigation mechanisms (insurance, partial risk guarantees, etc.) exist.

**4.2 Off-take agreement negotiation process / mechanisms in place:** Negotiation process is clear and covers all critical areas; precedent for enforceable agreements exists in local market (Forex, Change in law/tax, Force Majeure, Offshore Arbitration, Termination Provision, Transmission/ Interconnect Risk, Duration commensurate with financing).

**4.3 Human capital—project finance:** Government staff has experience developing economically viable projects, understand cost recovery and return on investment. Experience and expertise required will vary based on the role of the government in geothermal development.

#### TYPICAL CONDITIONS PRECEDENT FOR PRIVATE LENDER FINANCING

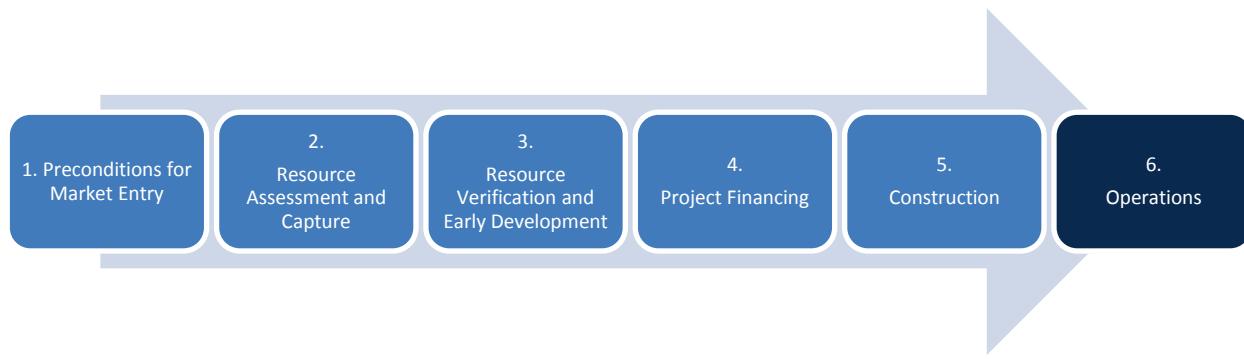
- 70-100% of resource proven through production drilling
- 1.5x (or better) debt service coverage ratio from project cash flows
- PPA signed by creditworthy off-taker (or guarantee in place)
- All permits obtained and in good standing
- Project contracts obtained (interconnect, EPC contract, etc.)
- Insurance documentation
- Independent engineer report
- Environmental report
- Resource report
- Legal opinions
- Financial statements
- Collateral (in some cases)
- Project budget, timeline, and financial model
- Property titles, other forms proving access to and right to explore land



## 5. Construction

**5.1 Construction permitting process:** Process and authority for obtaining construction permits is clear and efficient. Key permits may include: well testing and production/flow, roads and locations/right of way, interconnection, general construction permit, environmental permits, substations, systems testing, operating permit.

**5.2 Human capital—construction:** Local expertise for most activities; only the most complicated technical issues require international experts



## 6. Operations

**6.1 Human capital—operations:** Expertise exists such that only the most complicated maintenance issues require international experts to be brought in. Staff adheres to international standards for health, safety, and environment. Reporting and monitoring requirements are clear and are followed.



## APPENDIX C: REPORT RECOMMENDATIONS (DETAIL)

As mentioned at the beginning of this strategy, this is intended to be a living document that is updated at regular intervals to reflect the changes in country policy and development objectives, donor strategies, and private sector activity. In a few cases, country-specific recommendations are vague as of this writing, as significant work is being done by other donors to determine the most logical next steps.

This strategy also seeks to build on the efforts already underway, and to leverage those country and regional institutions that are already established. There are many strong programs and facilities already in place. This strategy seeks to highlight them and bring them into a more comprehensive framework where they can be implemented more widely. It does not seek to replace or supplant existing efforts.

This section outlines recommendations that apply either regionally, or to multiple countries within the region. This section is followed by a detailed analysis of geothermal development on a country by country basis, with specific country recommendations included therein.

### **Key recommendations:**

#### **1 FINANCING AND RISK MITIGATION FOR DRILLING AND EARLY PROJECT DEVELOPMENT**

It is widely recognized that the exploration phase for geothermal (from surface studies to production drilling) is both expensive and risky. To help mitigate the risk to private (and public) developers, a number of initiatives have been put in place by donors, and governments have in some cases taken it upon themselves to carry out exploration up to and including production drilling. As outlined in the chart below, the facilities available primarily cover the earliest exploration costs—from surface studies through exploration drilling. For private developers, there are currently no facilities available to finance or help mitigate the risk of production drilling<sup>25</sup>. This phase of development can often consume 40-50% of project costs, and represents the final hurdle (in terms of resource development) to obtaining project financing. When speaking with developers, lenders, and equity providers, all identified this gap in financing/risk mitigation for production drilling as a key barrier to bringing geothermal development projects online.

<sup>25</sup> Insurance products from private underwriters do cover some risk, and are gradually expanding to cover the drilling of additional wells. In all but a couple of cases in Kenya, these products are not yet able to cover enough drilling risk such that developers will be able to obtain additional investor capital or project financing.

A second key barrier for private developers to bringing projects on line without significant delays is the need to procure long-lead items (turbines, wellheads, casing, etc.) such that projects are not delayed while waiting for financial close. A product structured to provide or guarantee this financing would help mitigate significant project delays.

Program	Description	Surface exploration	Exploration Drilling	Production drilling	Construction	Operations	Transaction costs	Pros	Cons
UNEP/ ICEIDA	Funding and technical assistance for surface exploration	X						•Means to identify high priority projects for further exploration	•None
GRMF	Grant facility to fund early surface and some exploration drilling costs	X	X					•Available to public or private •Many uses	•Annual application cycle •Small facility
ACEF, ALSF	Grant facility to fund early development and transaction costs	X				X		•Mitigates transaction risk •Flexible application	•ACEF limited to US service providers •Small grants
Drilling Insurance: Munich Re	Insurance product for earliest (exploration) drilling risk		X					•Partially insures riskiest wells	•High premium costs •Does not cover production drilling •Does not address capital needs
Drilling Insurance: Parhelion (tentative)	<i>Insurance product to cover some production drilling</i>			X				•Partially mitigates production drilling risk	•Still considerable risk remaining •High premium costs •Does not address capital needs
Project Financing	Traditional debt from donors or private lenders				X	X	X	•Low cost capital to bring projects to COD	•Only available after majority of risk mitigated
Private Insurance	Traditional insurance required by project lenders				X	X		•Protection against project delays, performance issues, force majeure	•Only available after majority of risk mitigated
Risk Guarantees	Facilities to mitigate political, performance risk				X	X		•Protection against political, off-take risk etc.	•Mostly available after majority of risk mitigated

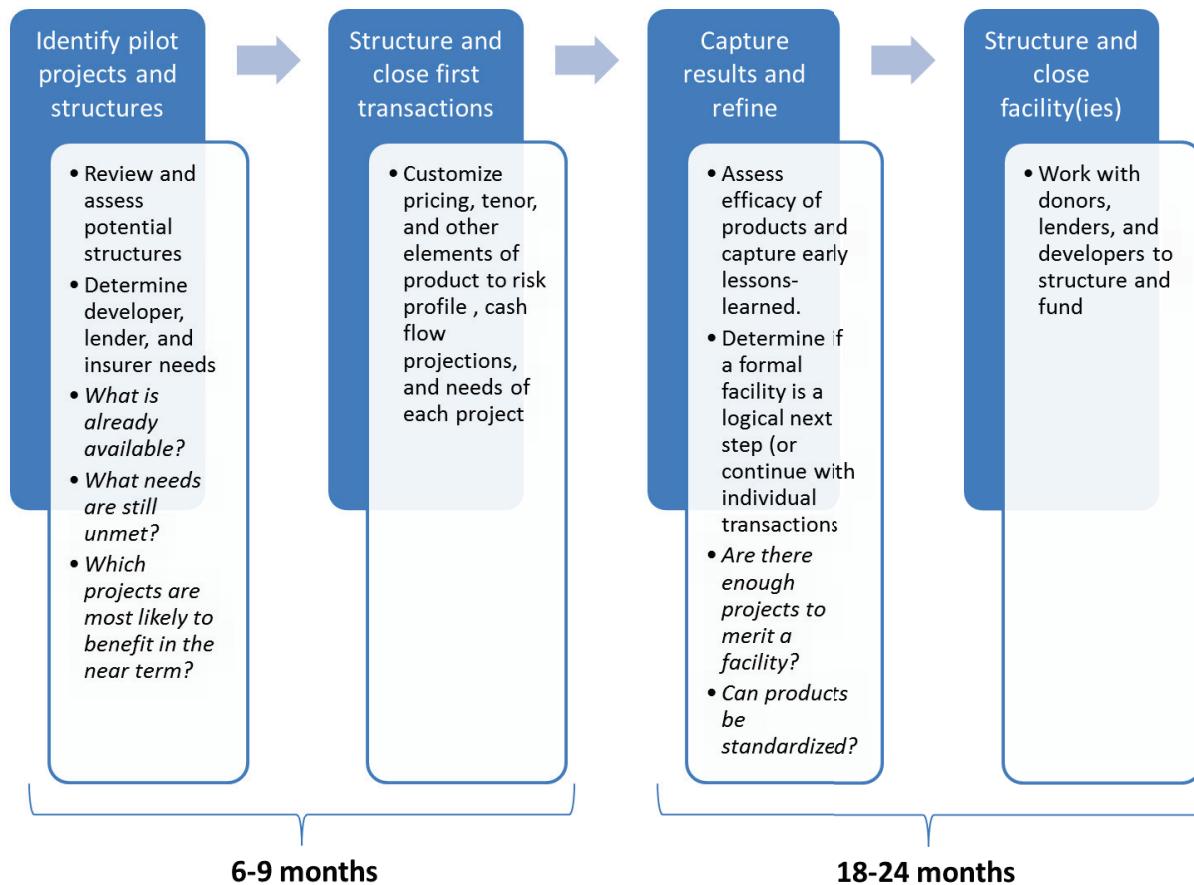
The structure of a potential financing and risk mitigation facility will depend on project pipeline (determines size, ability to spread risk), donors (size, structuring to meet donor requirements), interest/strength of private financial institutions (pricing, structuring), and developer ability to match leverage requirements. Ideally, some form of private debt financing would be available for production drilling, but the overall risk of production drilling and the lack of project pipeline to diversify risk make it unlikely that an appropriately priced product could be structured without some form of donor guarantee/backing and/or insurance. Further study of existing models and discussions with donors and private lenders and insurers to assess interest and determine structure are needed. Next steps should include a review of 1) proposed private insurance mechanisms, 2) research carried out by IFC and KfW on risk mitigation, and 3) the structures and approaches of the World Bank Global Geothermal Development Program.

Given the complexity and long development cycles of geothermal projects, a “one-size fits all” facility may not be practical, particularly in the near term. A reasonable intermediate step to support the goal of accelerating geothermal development would be to structure custom financial products for those projects that are most advanced, while looking toward a more formal facility in the medium-long term.

Transaction advisors, such as those engaged under Power Africa, can help to identify the most advanced projects, determine needs, and coordinate between donors, developers, lenders, and investors to structure an appropriate product. Another key service these advisors provide is to help private developers understand the various risk mitigation, grant, and financing products available (as

outlined above), eligibility, timing, and requirements for application (as appropriate). When interviewed, numerous developers were unaware of the different funding and insurance sources available, or were unclear on their parameters and therefore were not incorporating them into the risk mitigation and financing strategies.

#### Illustrative Timeline for Piloting Financial and Risk Mitigation Products



## 2 DEVELOPMENT OF STANDARD GEOTHERMAL ACT AND POLICIES

Country assessments revealed numerous gaps in policy development, even in the countries with the most advanced geothermal programs. Key gaps identified include:

- **Lack of a geothermal specific law or act:** Many countries govern geothermal through some version of a mining act. This leads to problems with issuing concessions (first come, first served approach leads to unqualified entities obtaining concessions for speculative purposes), determining development requirements and timing, and ultimately granting permission to sell electricity into the power grid.
- **Structure and function of agencies:** related to the lack of legal framework is the commensurate institutional framework. In some countries, geothermal is under a number of ministries, or it is under one ministry, but in a tiny off-shoot department with little power or expertise. A centralized “one-stop shop” for geothermal development is one approach, but this must be clearly defined, and caution should be taken in having the government get too heavily involved in geothermal exploration (see Text Box).
- **Tariff regime:** The range of issues related to developing a tariff policy is wide, and include:

- FITs that are too low to yield a return for all but the largest and easiest to develop projects. There is little/no availability to negotiate an increase for projects that are smaller, more remote, or that have other challenges that require additional time and/or capital
- FITs that are not in place long enough for projects to qualify (timing is not reflective of the longer geothermal development cycle)
- The off-taker and/or regulator lack the expertise and authority to negotiate a tariff that is cost reflective for them, and will yield a return for the developer
- **Concession tendering process and development requirements:** The process for tendering a concession should:
  - be geared toward qualified (financial and technical) developers that adhere to international standards for health, safety, environment, and quality, and are not based entirely on price or development budget
  - include robust, high quality, surface and subsurface data in a standard format(in the case of a PPP approach)
  - clearly establish land rights
  - provide sufficient time for concession development
  - provide clear criteria and reporting requirements that will be used to evaluate progress on the concession
  - offer a standard PPA to the successful bidder to facilitate access to financing once the resource was confirmed. The PPA should allow for adjustment of the tariff to allow the developer to realize a reasonable return on equity
- **Rig tendering:** greater emphasis needs to be placed on adherence to international standards, and avoid using price as the lone criteria for evaluation

Many of these issues are being examined and address in the IFC project to develop a master plan for geothermal development in Ethiopia. The outcomes of this project should be evaluated for application regionally or on a country by country basis.

### 3 DATA COLLECTION

Collection of high quality data in a standardized format is critical at every phase of geothermal power development, construction, and operations. Without robust data, it is impossible to determine the characteristics of a resource, target production wells, learn from drilling errors, track construction expenses, and monitor steamfield performance, among others.

Data collection was identified as a weakness in every country in this strategy. The ARGeo program has developed a Geothermal Inventory Database (AGID) that has information on projects, sites, stakeholders, manpower, equipment, laboratories, reports, maps, etc. AGID has emphasized the importance of geothermal related data and information collection, and has compiled a database of reports on different resources, but is not clearing house for raw data (nor should it be). A more comprehensive study of data collection practices in each country is needed, and should be combined with recommendations for the ideal way to collect and store data, including how it should be presented, common software needed, etc.

### 4 REGIONAL GEOTHERMAL ASSOCIATION

Geothermal energy development is of relatively high priority in all of the countries covered in this study. It is of equally high priority for donors, as reflected by the numerous technical assistance activities and financing initiatives throughout the region. There is a need to capture the results of these activities, disseminate lessons learned, and maintain momentum and interest in geothermal should government or donor priorities changes into the future. A regional geothermal association—initially funded by donors, but with a clear path toward sustainability—could serve this purpose. Indeed, a regional geothermal association could:

- Identify trends across countries and convene donors, governments, and the private sector to develop solutions to key issues, share innovations, etc.
- Provide guidance to donors, governments, and the private sector on best approaches to geothermal development
- Preserve and disseminate institutional knowledge: Serve as a repository for information, studies, training materials, reports, etc.
- Provide or coordinate training on important geothermal topics
- Provide assistance/guidance to country-level geothermal associations
- Serve as institutional home and convening body for regional geothermal development strategy

Members could include government officials working in geothermal power (or renewable energy), donors, private sector developers and service providers, investors, lenders, and other providers of capital for geothermal. The association would become self-sustaining through membership dues, and fees charged for services (training, data storage, etc.).

Surveys from 3 of 6 countries in this study (Rwanda, Uganda, and Ethiopia) showed broad based support from governments, donors, and the private sector for a regional geothermal association. 94% of respondents (32 out of 34) indicated strong or very strong interest in such an organization.

The East Africa Regional branch of the International Geothermal Association (IGA) has already been established, a board created, and bylaws adopted. This association was established with the assistance of UNEP and is currently working with the UNEP ARGeo program. The regional branch already has members from a number of countries in the region. Having the basic infrastructure in place and the initial name recognition in the region, it would be the logical target for donor assistance to create and implement a business plan, provide funding for staff and technology, and general assistance to build out capacity.

## 5 REGIONAL CAPACITY BUILDING

Numerous donors are engaged in capacity building for geothermal development. While this is the area with the most technical assistance provided, it is also the least coordinated, and the most in need of a comprehensive approach. In numerous interviews and stakeholder discussions, concern over the ad hoc approach to training and capacity building was expressed. Because workshops and trainings are relatively low cost, and have very short lead times for implementation, the region has seen a proliferation of workshops on a variety of topics. There tends to be overlap in workshop topics and inconsistency in attendees. A more comprehensive approach to identifying skill gaps/needs, determining the appropriate timing, and developing a common curriculum/approach to training would help improve the return on donor funds dedicated to training and capacity building. Such an approach should be sure to coordinate and leverage the already existing initiatives such as the African Geothermal Center of Excellence (led by GDC in Kenya), the UNU-GTP program, JICA's training efforts, etc.

A comprehensive regional training program would:

- Start with a skills gap analysis by country (including an understanding of the role of government in geothermal and the commensurate skills needed now and in the future)
- Develop a timeline for when trainings should be delivered to prepare government officials using a just-in-time approach such that skills learned were immediately applicable to the trainees job
- Involve on-the-job training where possible (leveraging expertise in countries such as Kenya and Ethiopia where exploration and policy development (respectively) are more advanced), or expertise from for example New Zealand, Iceland, US, Italy etc.
- Include training for private sector where possible



- Focus on identifying the appropriate individuals and functions to receive training, and ensure those individuals attend all programs (no replacements allowed)
- Work from a common curriculum grounded in international geothermal principles and practices

Numerous donors and government programs exist for training and capacity building in geothermal:

- JICA/Japan provides both training and capacity building in-country, and brings key officials to Japan for several weeks of training on key topics each year.
- ICEIDA/Iceland has an in-depth training program in Iceland through the UN University.
- PowerAfrica has embedded advisors in GDC in Kenya and Ethiopia.
- AUC has carried out a skills gap assessment in 11 countries in East Africa.
- GDC is looking to establish a center of excellence in Kenya to provide comprehensive training (classroom and on-the-job) for geothermal development.

#### Key Partners for Regional Capacity Building

In developing a coordinating regional capacity building strategy, it is important to leverage the existing resources and efforts of government, donors, the private sector, associations, and academia.

**Governments:** Governments have a vested interest in training their employees, as well as building a highly trained private workforce. GDC has been very proactive in developing a “Center of Excellence”, which could be a foundational component of a regional capacity building program. In addition, Rwanda, Uganda, and Kenya have developed a formal collaboration effort on a number of regional energy issues, including geothermal. A regional capacity building program should leverage this existing cooperation.

**Academia:** Local community colleges, professional training centers, and universities can be key partners in developing training curricula and methodology, providing facilities, etc.

**Associations:** Professional associations often have existing training programs and qualified trainers at the ready. The US Energy Association, Geothermal Energy Association, and other international professional associations can be key partners. Furthermore, the East Africa branch of the International Geothermal Association could serve as coordinator of the overall capacity building program (see Section 10).

**Private Sector:** Importing labor and expertise from around the world adds to a developer’s project costs, and therefore affects returns. A highly skilled local workforce is therefore beneficial to the private sector. The private sector can be a financial sponsor, as well as a source for trainers, on-the-job opportunities, and curriculum review/oversight.

**Donors:** Many donors have a long track record of capacity building for geothermal, including those with longer-term training programs (e.g. ICEIDA/UNU-GTP, JICA). These programs should be factored into a regional program to leverage already existing resources and maximize the training opportunities in geothermal.

Most of the key pieces for a comprehensive training program exist, but they are not yet coordinated as such. Development of a comprehensive approach to capacity building would be an appropriate activity for a geothermal association, and could be carried out with assistance from the donor community. Leveraging its regional reach with donors, governments, and the private sector, the association could guide the development and coordination of capacity building programs. The initial work to design a regional capacity building program could be carried out by 1-2 consultants, collaborating with association staff.

## APPENDIX D: INDIVIDUAL COUNTRY ASSESSMENTS AND RECOMMENDATIONS

This section contains summaries of the status of geothermal in the six focus countries: Djibouti, Ethiopia, Kenya, Rwanda, and Tanzania. These summaries are based on interviews with key stakeholders in each of the countries, as well as reviews of reports on donor activities, surface studies, etc.

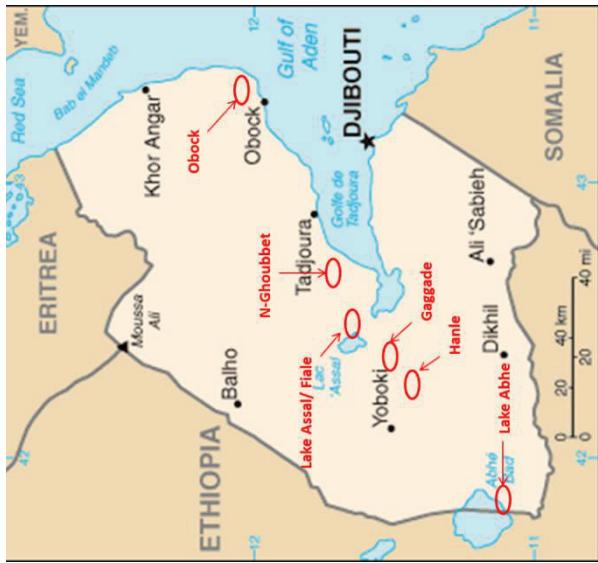
For each country, a summary by indicator is provided (under “Notes”), along with an assessment of the country’s performance/status for that indicator (low/medium/high). The indicator is then rated in terms of its importance for the country’s geothermal development. Finally, major donors with projects addressing some aspect of the indicator are identified. This analysis is used to develop the summary of the country in terms of geothermal, and to outline key priorities for donor assistance and/or government action.

The criteria for the low/medium/high assessment is included as Appendix E, with a summary of each country by indicator, priority, and donor is included in Appendix F. These two pieces form the framework for a snapshot view of each country’s geothermal development, donor activities, and priorities. These snapshots are intended to be updated at regular intervals (approximately twice a year) to help donors coordinate and prioritize activities and design technical assistance and financing programs. By quickly showing potential areas of need, donors can focus their analysis on certain areas to ensure the most critical needs of a country are being met.

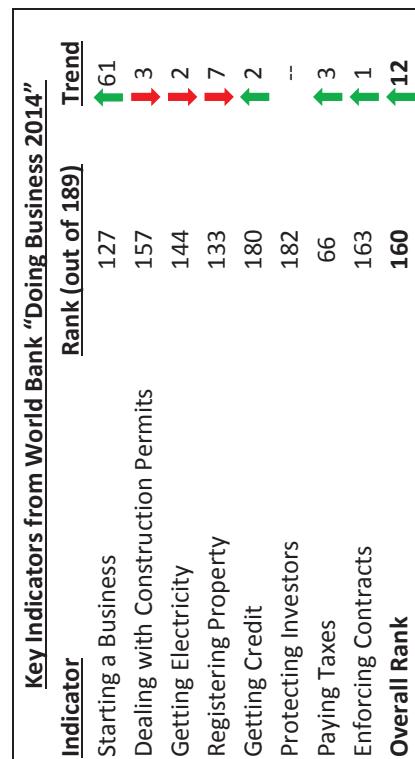


DJIBOUTI

**11 Major geothermal fields in Djibouti**  
**Source: CIA World Factbook, ESMAP**



Estimated Size of Resource:	~100+MW
MW Online:	0MW geothermal
Main geothermal fields:	Gaggade, Hanle, Lake Abhe, Lake Assal/Fiale, N-Ghoubbet, Obock
Department/ Ministry overseeing geothermal:	ODDEG
Governing laws:	through Mining Law; IPP law
Regulator:	MoE
Off-taker:	Electricite de Djibouti (EDD)
Distribution company:	Electricite de Djibouti (EDD)
Generator(s):	Electricite de Djibouti (EDD)
Private sector activity:	Numerous unsolicited proposals have been presented to the government; none seem serious except for Reykjavik Energy (REI) in the late 1980s. Prior to the 2008 financial crisis, REI was carrying out exploration activities at Lake Assal and was selected by the World Bank ARGeo drilling risk insurance program. REI was unable to reach agreement on a PPA stopped work due to financial difficulties.
Other projects in development (public sector):	The World Bank is leading a consortium of donors (AFD, AfDB, OFID) to develop a \$31M drilling program designed to lead to a PPP for a 50 MW power plant once the initial work is completed (through a competitive international tender).
Major donors and their projects:	Power Africa is providing a transaction advisor, as well as capacity building and technical assistance to improve the enabling environment.





#### **OVERVIEW:**

The country has a history of private sector interest, and is a strategic priority due to its location in the region. Recently, the Office for Development of Geothermal Energy (Djibouti) (ODDEG) was installed under the Office of the President and given the responsibility for carrying out geothermal development and project management for the country. A recently-passed IPP law will serve as a key piece of legislation driving the enabling environment. In order to encourage private sector development (as the Government has indicated it supports), an improved enabling environment, a reasonable tariff, and clear political will are needed.

Numerous efforts to develop geothermal in Djibouti have been made over the last 45 years, primarily led by donors. As a result, significant data on the geothermal resources (particularly at Lake Assal/Lava Lake) exist, which would seem to indicate that Djibouti is ripe for the development of a geothermal power plant. Previous private sector development stalled at various stages due to a) the 2008 financial crisis (Icelandic investor), and b) belief that the capital requirements to mitigate the high salinity of the geothermal brine would be uneconomical (recent technological advances have helped to bring costs down).

The Government of Djibouti (GoDj) seems to be highly supportive of geothermal, having installed ODDEG directly under the Office of the President. However, early indications on acceptable (to GoDj) tariff levels (particularly when compared to anticipated low prices coming from Ethiopian hydropower) indicate that further challenges lie ahead to pave the way for private sector development.

In May of 2013, a consortium of donors led by the World Bank approved a projected to drill exploratory wells at Lake Assal, and to prepare a feasibility study for a potential tender of a concession to an IPP to carry out the remaining drilling, construction, and operation of a ~50MW plant. This project has been delayed for various reasons (turn over within donor organizations, lack of clear responsibility within the Government of Djibouti, etc.), but has been restructured. The bank has issued a tender for a company to oversee the drilling and implementation of the program (should be in place in September 2015), and the Government of Djibouti has established and assigned key staff to a Project Implementation Unit (PIU). The geothermal consulting company (GCC) should be on board by August, along with an international project director and environmental and social experts.

USAID/Power Africa have assigned a transaction advisor to coordinate with the World Bank team to drive the project toward an IPP tender. The transaction advisor, in cooperation with the Power Africa geothermal team, will work to advance the Lake Assal Project and North Ghoubbet, as appropriate. EAGP will provide training in key technical areas to build government capacity.

The most critical needs in Djibouti at this time are 1) capacity building for ODDEG, 2) technical assistance to develop the enabling environment for private sector geothermal development, and 3) Completion of surface and subsurface exploration, complete with robust data collection and analysis to be made available to potential private developers and financiers. More broadly (beyond the scope of this strategy) is a critical need to improve the governance and investor protection in the country in order to give confidence to private sector geothermal developers.

#### **Top priorities:**

- **Technical assistance to design the overall structure of the agency(ies) responsible for the oversight, management, and development of geothermal.** There are currently 3+ ministries overseeing different aspects of geothermal, not including the Djiboutian Office for Development of Geothermal Energy (ODDEG) which is under the Office of the President. This leads to considerable confusion and competition between entities, resulting in project delays.

- **Technical assistance to develop a legal and regulatory framework for geothermal.** There is currently no governing laws or regulations for any aspect of geothermal—tendering, permitting, drilling, construction, operations, etc. In order for the government to be prepared to tender the Lake Assal concession at the completion of the World Bank drilling and feasibility program, a basic legal, institutional and regulatory framework will need to be in place.
- **Capacity building for government staff.** There is a critical need to develop the capacity of government staff to design, oversee, and implement geothermal projects, most critically in terms of public-private partnerships as envisioned by the World Bank consortium.

Indicator	Notes	Assessment	Priority	Active Donors
<b>1. Preconditions for Market Entry</b>				
1.1 Government Support – Legal / Policy	<p><b>Summary:</b> There is no legal or regulatory framework for geothermal development in Djibouti.</p> <p>The government is supportive of geothermal; however, there is little clarity as to who is responsible for carrying out geothermal exploration, development or regulation, with ODDEG falling under the auspices of the presidency, while the World Bank consortium project is under MoE. Surface and subsurface data is housed with the Ministry of Higher Education and Research, etc.</p>	Medium	2	Power Africa
1.2 Government support—Tariff regime	<p><b>Summary:</b> There is no specific tariff regime for geothermal. Historically, Djibouti had the highest electricity prices in Africa until an interconnection line between Djibouti and Ethiopia was completed, significantly lowering the cost of energy. Nevertheless, prices remain high, and geothermal represents a lower cost source of domestic energy compared to Heavy Fuel Oil and Diesel—the primary sources of electricity production in Djibouti.</p>	Low	3	Power Africa
1.3 Contract sanctity	<p><b>Summary:</b> Contract sanctity is extremely low. Djibouti ranks 180/189 in terms of protecting investors</p>	Low	1	
1.3 a Risk mitigation for business and contract risks	<p><b>Summary:</b> No specific mechanisms exist to protect investors. Risk guarantees from donors would be needed.</p>	Low	1	
<b>2. Resource Assessment and Capture</b>				
2.1 Surface and subsurface data	<p><b>Summary:</b> Surface and subsurface studies have been carried out since 1973, and have included geophysical surveys (MT &amp; TEM), as well as a number of exploration wells. Significant information about the resource at Lake Assal (geochemistry, reservoir characteristics, etc.) is available, and a 3-D model of the reservoir has been built. This information has been used by the World Bank consortium to scope the drilling program. REI has also agreed to provide the data and analysis from their previous efforts to the consortium. This work included significant work at Lava Lakes.</p>	Medium	3	World Bank, JICA
2.2 Legal framework for concession and development rights	<p><b>Summary:</b> There is no framework for concession and development rights. Numerous MOUs for geothermal development have been signed by the government, but a review of these MOUs indicate that few, if any, are with serious developers with the exception of REI in the late 1980s.</p>	Low	1	Power Africa
2.3 Technical knowledge in government agencies	<p><b>Summary:</b> Technical knowledge is low; furthermore, it is unclear which government agencies will be responsible for carrying out geothermal exploration, development and regulation</p>	Low	1	Power Africa
2.4 Strength/Capacity of regulator	<p><b>Summary:</b> There is not an independent regulator. Electricity is regulated by MoE</p>	Low	3	

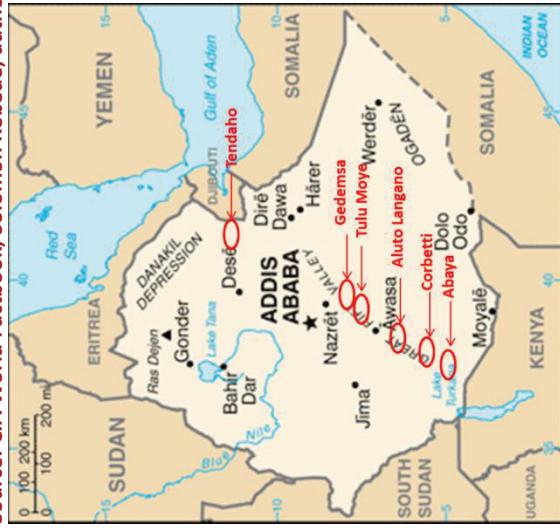
Indicator	Notes	Assessment	Priority	Active Donors
<b>3. Resource Verification &amp; Early Development</b>				
3.1 Access to finance and risk mitigation products	<b>Summary:</b> Financing is limited to donors Djibouti became eligible for GRMF funding for carrying out surface and subsurface studies and reservoir confirmation drilling. The UNEP ARGeo is also looking to provide assistance in furthering exploration	Low	3	
3.2 Access to drilling rigs, ancillary drilling services	<b>Summary:</b> Drilling and drilling services companies have been shortlisted for the upcoming tender for Lake Assal. Rigs may be available from the region, or may need to be brought through the port. A number of drilling rigs are now available in the region and there is increasing access to drilling support providers	Medium	3	World Bank consortium
3.3 Clear permitting process	<b>Summary:</b> There is no permitting process for geothermal.	Low	2	
3.4 Human capital – resource development	<b>Summary:</b> Capacity is low in this area as well.	Low	2	
<b>4. Project Financing</b>				
4.1 Credit-worthy off-taker	<b>Summary:</b> The off-taker, EDD, is very close to insolvency. Prior to the construction of the transmission interconnect between Ethiopia and Djibouti, power prices were >\$0.30/kWh, which entailed heavy subsidies from the government. Compounding this was low collection rates. The financial situation of EDD has not necessarily improved since the transmission line became operational.	Low	1	
4.2 Off-take agreement negotiation process / mechanisms	<b>Summary:</b> There is no process for negotiating PPAs	Low	2	
4.3 Human capital – project finance	<b>Summary:</b> Capacity is low in this area. There is a critical need for government staff with project development expertise, as well as (eventually) project finance.	Low	1	
<b>5. Construction</b>				
5.1 Construction permitting process	<b>Summary:</b> There is no construction permitting process	Low	3	
5.2 Human capital – construction	<b>Summary:</b> No specific geothermal expertise	Low	3	
<b>6. Operations</b>				
6.1 Human capital – operations	<b>Summary:</b> No specific geothermal expertise	Low	3	

## DJIBOUTI PRIORITIZED RECOMMENDATIONS

	0-12 Months	12-24 Months	24+ months
	Priority 1	Priority 2	Priority 3
<b>1. Pre-Conditions for Market Entry</b>	<ul style="list-style-type: none"> <li>Development of legal and regulatory framework for geothermal</li> </ul>		
<b>2. Resource Assessment and Capture</b>	<ul style="list-style-type: none"> <li>Development of concession application/tender and development process</li> <li>Technical assistance to ODDEG build capacity</li> </ul>		
<b>3. Resource Verification and Early Development</b>		<ul style="list-style-type: none"> <li>Development of permitting process for drilling</li> <li>Development of PPA</li> <li>Capacity building for PPA negotiation</li> </ul>	
<b>4. Project Financing</b>		<ul style="list-style-type: none"> <li>Capacity development for overall project management—from project design through to project financing</li> </ul>	
<b>5. Construction</b>			
<b>6. Operations</b>			

# ETHIOPIA

**1 Major geothermal fields in Ethiopia**



Source: CIA World Factbook, Solomon Kebbede, author

Estimated Size of Resource:	~5,000+MW
MW Online:	<7MW (Aluto-Longano)
Main geothermal fields:	Corbett, Aluto-Longano, Tendaho, Abaya, Tulu Moye, Gedemsa
Department/ Ministry overseeing geothermal:	Ministry of Water, Irrigation, and Energy (MOWIE), Ministry of Mines, Ethiopian Electric Power (EEP), Ethiopian Electric Utility (EEU)
Governing laws:	Mining Law
Regulator:	Ethiopian Electricity Agency (EEA)
Off-taker:	EEP
Distribution company:	EEU
Generator(s):	EEP
Private sector activity:	Reykjavik Geothermal (RG) has concession rights to develop up to 1,000MW at Corbett and surrounding fields in southern Ethiopia. RG is currently in PPA negotiations for the first phase.
Other projects in development (public sector):	see donor projects below
Major donors and their projects:	<ul style="list-style-type: none"> <li>IFC developing strategic plan to determine structure, policy, and development models for geothermal</li> <li>PowerAfrica supporting govt' and RG on Corbett transaction</li> <li>GRMF providing support to Corbett for drilling</li> <li>AFD supporting drilling of shallow and deep resources at Tendaho and refurbishing two drilling rigs owned by GSE</li> <li>JICA preparing a Master Plan for all geothermal resources; will conduct geophysical surveys at the highest ranking sites</li> <li>ARGeo funding review of exploration data from Tendaho and preparation of a conceptual model for siting and targeting wells</li> <li>World Bank funding the purchase of two drilling rigs, drilling of up to 22 production/injection wells at Aluto Longano, and drilling of up to four reservoir confirmation wells at Allalobad (Tendaho field)</li> <li>ICEIDA will support GSE in conducting surface and geophysical surveys at Aluto 2-3, and EEP for drilling of 22 wells at Aluto 1.</li> </ul>

Indicator	Rank (out of 189)	Trend
Starting a Business	166	↓4
Dealing with Construction Permits	55	--
Getting Electricity	91	↑7
Registering Property	113	↓6
Getting Credit	109	↓4
Protecting Investors	157	↓1
Paying Taxes	109	↓6
Enforcing Contracts	44	--
<b>Overall Rank</b>	<b>125</b>	<b>↓1</b>



#### **OVERVIEW:**

Geothermal energy is a top priority in Ethiopia, as reflected by the flurry of activity from donors, the government, and the private sector. Two major activities are driving progress in the sector, with a number of other donor programs providing additional policy assistance and drilling/exploration financing. The flagship geothermal activity in the country is the development of the Corbett field by Reykjavik Geothermal. PPA negotiations are reaching their conclusion, and assuming a successful outcome, exploration and drilling for the first 70MW phase should commence in late 2014 or early 2015. The Corbett transaction is both highlighting key issues with the current legal and regulatory structure for geothermal, while simultaneously driving reform in these areas as the government seeks to ensure the transaction (and development) progresses. Indeed, Corbett is paving the way in many cases for future private sector development in geothermal. The government, in receipt of loans and grants from the World bank, is in the process of developing the well field at Aluto Langano, and the World Bank will be supporting government exploration in advance of a PPP tender at Allalobbad,. Ethiopia is poised to have 3 major development models (private, public, and PPP respectively) in process simultaneously. Their experiences with each will be highly informative to other East African countries as they look to determine their approach to geothermal development.

Parallel to the development of Corbett is a comprehensive strategy and master plan project to design the appropriate structure and legal environment for geothermal development in Ethiopia, led by the IFC. The IFC has been working with the government of Ethiopia to discuss the appropriate models for developing geothermal in the country, the required legal and regulatory structures for each model, and the level of capacity building required within the relevant agencies. The IFC presented its finding and recommendations in December 2014, and has been coordinating with donors and the GOE since that time to implement the recommendations.

The IFC and PowerAfrica are now working closely to implement many of the policy recommendations from the IFC study. This work includes drafting of geothermal laws (including concession processes), and a data assessment, *inter alia*.

#### **Top Priorities:**

- **Development of structure within government entities to effectively manage geothermal development.** This work is underway by the IFC.
- **Legal and regulatory framework specifically designed for geothermal.** This work is underway by IFC, with assistance from Power Africa (EAGP) and other donors.
- **Comprehensive approach to capacity building for government and private sector.**
- **Data collection and analysis systems.** Many surface and subsurface studies have been completed or are in progress. The data from these activities needs to be collected in a format that is easily accessible by developers, research institutions, the government, etc. Proper collection and management of high quality data will lead to better tenders under the PPP model currently contemplated for Allalobbad. EAGP is leading this effort.

Indicator	Notes	Assessment	Priority	Active Donors
<b>1. Preconditions for Market Entry</b>	<p><b>Summary:</b> There is no legal or regulatory framework specific to geothermal, and the mining law currently governs the sector. The mining law does not fully cover key aspects of geothermal development, and is therefore inadequate as a permanent legal framework. In addition, the organization structure to oversee geothermal is spread between a number of agencies. The IFC project is designed to address both of these issues, with likely need for follow on assistance.</p> <p><b>Government support for geothermal development is very high, with the prime minister voicing his support for the Corbett project in particular. Geothermal development is very high profile in the country.</b></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Power System Expansion Master Plan envisages an increase of geothermal capacity from currently 7 MW (Aluto Langano pilot plant) to 5,000 MW in 2037 (or 15.5% of the anticipated total installed capacity).</li> <li>Investment in geothermal resource development is subject to the Mining Proclamation No. 52/1993, as amended, which provides licensing for the duration of “resource life” The mining law also calls for a royalty on production and for a government equity position in the project of 5%, which can be a disincentive for private sector development. The Mining Law is also posing challenges to the PPA negotiations at Corbettii.</li> <li>Fiscal incentives are available for electricity generation, but fiscal framework for geothermal energy is different between mining and energy law (e.g. different income tax and depreciation rules); unclear royalty calculation<sup>26</sup>. Incentives for investments in renewables include duty-free allowance for capital import goods</li> <li>Gap between exploration done by Ministry of Mines and GSE; licenses issued by Ministry of Mines; but development through MoWIE/EEP, etc.</li> </ul>	Medium	1	IFC
<b>1.2 Government support—Tariff regime</b>	<p><b>Summary:</b> Power prices in Ethiopia are driven by hydro power and are not cost reflective (subsidies exist). Current pricing for geothermal (per the Corbettii negotiation is \$0.07-0.08/kWh. This is likely not sufficient for smaller geothermal plants. There is limited capacity in</p>	Low/Medium	2	IFC USAID/ PowerAfrica

<sup>26</sup> IFC/Fichtner Summary of Interim Report “Assessment of Options for Geothermal Development in Ethiopia” July 2014.

Indicator	Notes	Assessment	Priority	Active Donors
	<p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• No existing feed-in tariff mechanism, though one has been in development since 2009</li> <li>• Government currently negotiating PPA with Reykjavik Geothermal for ~\$0.075/kWh; low price of hydropower makes higher tariff difficult</li> <li>• New electricity law (which went into force January 2014) provides guidelines for fully off-grid and grid-connected IPPs, but tariff negotiation is still on a one-off, cost recovery basis by project</li> <li>• Assumptions on tariff – for Corbett, some assumptions were put in place in 2011. One assumption was that it would be treated as a mining project; in that case, the tax regime for mining law must be adjusted when Corbett becomes a generation project</li> <li>• Electricity is not cost reflective; tariffs are subsidized</li> </ul> <p><b>Summary: Ethiopia ranks low (157/189) for protecting investors according to the World Bank "Doing Business 2014" index.</b></p>	Low	3	
1.4 Contract sanctity	<p><b>Summary: While there are no particular guarantees to protect investors, the high priority of the Corbett transaction specifically, and of geothermal generally offers some comfort that contracts will be honored.</b></p> <p><b>2. Resource Assessment and Capture</b></p>	Low	3	
1.3 a Risk mitigation for business and contract risks	<p><b>Detail:</b></p> <p><b>Summary: Significant data exists from a number of studies that have been carried out at over 20 sites in the country. Several donors are working on surface and subsurface studies. The private sector has concerns about data collected and supplied by the public sector; it is sometimes not accessible, which could pose problems for field analysis, drilling planning, and future tender processes.</b></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• JICA is preparing a Master Plan for development of the most promising geothermal resources, which is scheduled to be completed in March 2015; their reports and raw data are being provided to the government. The team will finalize results in a project workshop and make (some) information publicly accessible. The project includes geology and geochemistry at about 20 sites throughout the rift area. Geophysical surveys will be completed on the best prospects (to start in October 2014).</li> <li>• ARGeo is funding the development of a conceptual model at Tendaho in advance of the drilling program being supported by AFD</li> </ul>	Medium	1	JICA AFD ICEIDA NDF

Indicator	Notes	Assessment	Priority	Active Donors
	<ul style="list-style-type: none"> <li>AFD has nearly completed a feasibility study at Tendaho; focusing on the drilling of a shallow well, and identifying locations for deep wells (Tendaho has both a shallow and deep resource). The next step will be an \$18M tender for drilling of the shallow wells (targeting 10-12MW at the shallow resource). 2 deep wells will be drilled into the deeper resource to estimate potential. A conceptual model is also being prepared at Tendaho.</li> <li>ICIEIDA and NDF are also doing surface studies in three exploration areas; Tendaho, Gedemsa, Aluto 2 and 3 as well as supporting EEP at Aluto</li> </ul> <p><b>Summary:</b> <i>To date, the legal framework for issuing concessions is the mining law. The process for issuing tenders under the Mining law is first come, first served, which has led to a number of mining concessions being granted to unqualified entities simply looking to grab concessions for speculation purposes to be sold later.</i></p>			
2.2 Legal framework for concession and development rights	<p><b>Summary:</b> <i>There is a long history of geothermal exploration in Ethiopia, therefore the Geological Survey of Ethiopia (GSE) has a large cadre of experts with experience in surface and subsurface exploration; however, there is significant turnover at GSE as staff tend to leave for more lucrative jobs in the private sector. Even though the GSE has experienced staff, for the scale of geothermal development currently under consideration by the Government, additional experts will be needed. The IFC work will look into the appropriate staff size, skill mix, and private sector needs.</i></p> <p><i>Outside of the GSE, expertise is more limited.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>The Geological Survey of Ethiopia has been involved in geothermal exploration since the 1960s; however, there is not enough technical knowledge in key agencies, and this is under development.</li> <li>The Geothermal Directorate within GSE currently employs 32 experts, which partially have only limited experience in the geothermal sector. About 50% of the employees have an employment record of less than 7 years, 40% have an employment record of more than 20 years.</li> <li>High staff turnover within GSE – trained employees leave to well-paid private sector jobs; there are eight open technical posts that could not yet be filled by employees. More appropriate employment terms might be needed in order to attract experienced staff to the sector and avoid exodus of GSE staff to the private sector.</li> <li>EEP will assume a greater role relative to geothermal development including the drilling of production and injection wells and the construction and operation of at least some power</li> </ul>	Low	1	IFC
2.3 Technical knowledge in government agencies		Medium	1	IFC

Indicator	Notes	Assessment	Priority	Active Donors
2.4 Strength/Capacity of regulator	<p>stations and the associated well fields. GSE will retain its role in exploration and reservoir confirmation drilling until a more permanent institution is in place.</p> <p><b>Summary:</b> <i>The Ethiopia Electricity Agency (EEA) is the energy regulator. It was established specifically to encourage and allow private investment in the sector. It is responsible for issuing licenses for generation and for regulating tariffs. They are currently engaged in negotiations with RG on the Corbett concession. Technical assistance is currently being provided to augment their geothermal specific knowledge. EEA also lacks expertise in financial modeling, which is critical to being able to understand and negotiate tariffs with private developers.</i></p> <p><i>EEA is not currently independent, but an independent Board of Directors is in the process of being established with the intent of making EEA independent from MoWIE.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Regulator has a very big mandate, as it will also oversee generation and transmission, and will eventually issue operating licenses.</li> <li>EEA needs a better understanding of PPA process (financial, legal, etc.); they have a strong leader in Ato Getahun, with strong supporting cast, but empowerment is needed to determine the mission, hire staff, etc.</li> <li>In terms of capacity, they are not different than any other Ethiopian institution; capacity building has been done in the past, but people leave</li> <li>Through the ALSF, Power Africa has hired foreign legal representation for EEA for the Corbett negotiations because no qualified representation exists at EEA.</li> <li>The EU is providing overall assistance (not geothermal specific) to EEA through a TOR starting with 3 experts working with EEA for 3-4 months, after which they will determine a long-term plan; Beyond the long-term (10-year) plan, EU is providing assistance in human resources, financing, IT and communications, performance monitoring, regulatory support, and operations. There is also capacity to assist with procurement.</li> <li>DFID is also providing some support.</li> </ul>	Low	2	EU USAID DFID
3. Resource Verification and Early Development	<p><b>3.1 Access to finance and risk mitigation products</b></p> <p><b>Summary:</b> <i>Local market conditions expect that drillers will assume risk and will manage risk mitigation on their own. No government-sponsored risk mitigation facilities are available, but donor facilities are accessible.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>GRMF is only major facility now; but MoWIE is focusing on this in the strategy; GOE may</li> </ul>	Medium	2	World Bank GRMF AFD

Indicator	Notes	Assessment	Priority	Active Donors
3.2 Access to drilling rigs, ancillary drilling services	<ul style="list-style-type: none"> <li>consider setting up a fund for original exploratory drilling</li> <li>The World Bank is providing funding for drilling at Aluto-Langano (exploration and production drilling), as well as at Allalobad (Tendaho field)</li> <li>AFD will be supporting new drilling at Tendaho that could lead to well field development by either the government or the private sector.</li> </ul> <p><b>Summary:</b> <i>Two government owned rigs are being refurbished (one is complete and drilling at Aluto Longano; the other will be refurbished soon for the AFD project at Tendaho). The World Bank grant/loan package includes \$60 million to purchase two new state of the art drilling rigs. The tender for those should be released in Q3 2014, with delivery 12-18 months after award.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Contracts for ancillary services, consumables, etc. could be provided by oil and gas drillers located in Africa</li> </ul>	Medium/High	1	World Bank AFD
3.3 Clear permitting process	<p><b>Summary:</b> <i>The Ministry of Mines issues licenses for geothermal exploration. As per the choice of the licensee, separate licenses can be acquired for Licensing (1 year), exploration (3-5 years), development duration (as per feasibility study), and production (25 years, renewable). Alternatively, a "cradle to grave" license encompassing all these areas may be acquired. The IFC is looking into permitting issues as part of its strategy.. Reykjavik Geothermal (RG) is also working with the government to address permitting issues as it progresses through its development process.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Corbett has an exploration license and is in the process of doing early drilling; there are a number of issues</li> <li>RG is not prepared to begin drilling until the PPA is finalized</li> <li>All land is owned by government, which simplifies a number of permitting and access issues faced in other countries</li> </ul>	Medium	2	IFC
3.4 Human capital – resource development	<p><b>Summary:</b> <i>EEP is in the process of developing a geothermal development team and will be contracting for technical services including a drilling supervisor to oversee operations for the drilling of 22 wells at Aluto. In general, additional capacity building will be needed if the Government decides it will play a significant role in drilling (e.g., either full steam field development or PPP), reservoir management and regulation</i></p> <p><b>Detail:</b></p>	Low/Medium	1	ICEIDA AFD

Indicator	Notes	Assessment	Priority	Active Donors
	<ul style="list-style-type: none"> <li>Even in countries with considerable experience in geothermal drilling developers often depend upon the services of international drilling experts to ensure proper technology and procedures are followed- it is just good practice and it is risky not to do so</li> </ul>			
<b>4. Project Financing</b>	<b>Summary: There are questions relative to credit-worthiness due to the fact that the new EEP does not have a balance sheet at this time (because it is newly spun off from EEPCo). Tariffs are currently subsidized; tariffs were pegged to the USD many years ago, and the birr is now worth half as much as it was at the time of the indexation.</b>	Low/Medium	2	PowerAfrica AfDB
4.1 Credit-worthy off-taker	<p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Long-run costs to the utility are not reflective in the tariff; capital costs for expansion of system, however, will need to be taken into account in the future</li> <li>EEP's revenues bounded back based on exports; EAPP strategy is very important to EEP</li> <li>The audit report will be disclosed on request</li> <li>High collections rates; and little technical theft; technical losses are the biggest problem</li> </ul>	Medium	1	PowerAfrica AfDB
4.2 Off-take agreement negotiation process / mechanisms	<p><b>Summary: No standard PPA or Interconnection Agreements available. The PPA for Corbett is currently under negotiation between Reykjavik Geothermal and EEP. Significant donor assistance is being provided to assist EEP in the process. The process currently underway should set precedent for future negotiations.</b></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Clifford Chance, a UK-based law firm hired through the African Legal Support Facility under the AfDB, put together a tip book of 18 questions; very basic legal questions to deal with basics of geothermal development in Ethiopia; 15 or 16 questions have been addressed, while the others are still up under negotiation</li> <li>The legal framework that exists today can address the questions at some level (maybe not at the level of detail eventually wanted/needed)</li> </ul>	Medium	1	PowerAfrica
4.3 Human capital – project finance	<b>Summary: Strong project finance and negotiations experience. Developing geothermal expertise through negotiations with RG. Limited knowledge of financial modeling.</b>	Medium	1	PowerAfrica
<b>5. Construction</b>				
5.1 Construction permitting process	<b>Summary: Permitting process and requirements are adequate and meet World Bank environmental and social standards</b>	Medium/High	3	
5.2 Human capital – construction	<b>Summary: Very little experience beyond the construction of the Aluto Langano facility some nearly 20 years ago.</b>	Low	2	

Indicator	Notes	Assessment	Priority	Active Donors
<b>6. Operations</b>	<b><i>Short term need to focus on exploration and drilling phases; construction and operations skills need to be developed in the medium term</i></b>			
6.1 Human capital – operations	<p><b>Summary:</b> Operations skills are not sufficient. The Aluto Plant has never been successfully operated and is not well maintained. Even after a refurbishment, the plant was never able to reach name plate capacity and has been unable to operate for over a year. Considerable issues with tendering process (and planning) for spare parts.</p> <p><b>Short term need to focus on exploration and drilling phases; construction and operations skills need to be developed in the medium term</b></p>	Low 2	2	

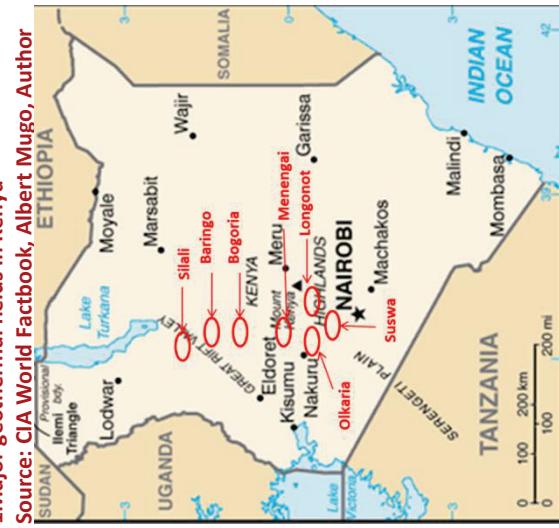
## ETHIOPIA PRIORITIZED RECOMMENDATIONS

	0-12 Months Priority 1	12-24 Months Priority 2	24+ months Priority 3
<b>1. Pre-Conditions for Market Entry</b>	<ul style="list-style-type: none"> <li>• Development of legal and regulatory framework for geothermal</li> <li>• Development of organizational structure to guide the development of geothermal</li> </ul>		
<b>2. Resource Assessment and Capture</b>	<ul style="list-style-type: none"> <li>• Improve, standardize, and make publicly available all surface and subsurface data obtained with public/donor funding</li> <li>• Development of concession application/tender and development process</li> <li>• Augment skills within GSE; expand training and capacity building to other agencies as appropriate (per outcome of IFC structuring work)</li> </ul>	<ul style="list-style-type: none"> <li>• Technical assistance to EEA to improve independence and properly manage mandate (capacity building, structuring, etc.).</li> </ul>	
<b>3. Resource Verification and Early Development</b>	<ul style="list-style-type: none"> <li>• Build technical capacity in drilling and other subsurface exploration and analysis to meet the need for multiple crews on multiple sites</li> </ul>	<ul style="list-style-type: none"> <li>• Technical assistance to resolve drilling permitting issues caused by Mining Law framework (find temporary solutions, then fully address in new legal framework)</li> </ul>	
<b>4. Project Financing</b>		<ul style="list-style-type: none"> <li>• Build EEA capacity to establish cost reflective tariffs, and reduce losses</li> <li>• Based on RG experience at Corbett, draft more standardized PPA and Interconnection agreements</li> <li>• Provide project finance training to EEA, EEP, and other agencies as appropriate</li> </ul>	
<b>5. Construction</b>		<ul style="list-style-type: none"> <li>• Provide training in issues specific to geothermal construction; consider regional exchanges for on-the-job experience</li> </ul>	
<b>6. Operations</b>		<ul style="list-style-type: none"> <li>• Provide training in issues specific to geothermal operations; consider regional exchanges for on-the-job experience</li> </ul>	

# KENYA



## 1 Major geothermal fields in Kenya



Indicator	Rank (out of 189)	Trend
Starting a Business	134	6 ↓
Dealing with Construction Permits	47	2 ↓
Getting Electricity	166	3 ↓
Registering Property	163	2 ↓
Getting Credit	13	2 ↓
Protecting Investors	98	3 ↓
Paying Taxes	166	5 ↓
Enforcing Contracts	151	--
<b>Overall Rank</b>	<b>129</b>	<b>7 ↓</b>

Estimated Size of Resource:	~10,000MW
MW Online:	530+MW (Olkaria) (280 MW at Olkaria was commissioned in 2014)
Main geothermal fields:	Baringo, Bogoria, Menengai, Longonot, Olkaria, Silali, Suswa, Paka and Barrier
Department/Ministry overseeing geothermal:	Kenya Geothermal Development Company (GDC), Kenya Generating Company (KenGen), Ministry of Energy
Governing laws:	Geothermal Resources Act of 1982, Environmental Management and Coordination Act of 1999, Energy Act of 2006 Rules and Regulations for Geothermal Drilling
Regulator:	Energy Regulatory Commission (ERC)
Off-taker:	Kenya Power and Lighting Company (KPLC)
Distribution company:	Kenya Electricity Transmission Company (Ketraco)
Generator(s):	Kenya Electricity Generating Company (KenGen), Ormat
Private sector activity:	<ul style="list-style-type: none"> <li>Ormat operates Olkaria III (OrPower IV)</li> <li>3 IPPs have been selected to develop 30MW power plants at the Memengai field</li> <li>Other private developers Agil (Longonot) and Akira (location near Olkaria) are developing concessions. A concession granted to WalAm Energy at Suswa was revoked in 2013 for lack of progress in development (under appeal)</li> </ul>
Other projects in development (public sector):	<ul style="list-style-type: none"> <li>KenGen operates ~480MW at Olkaria</li> <li>GDC actively drilling at Menengai to develop steamfield</li> <li>GDC looking to tender Bogoria-Silali block under a PPP structure</li> </ul>
Major donors and their projects:	<ul style="list-style-type: none"> <li>Numerous donors active in Kenya, including AFD, AfDB, EU/EIB, DFID, ICEIDA, JICA, KfW/GIZ, UNEP/ARGeo, World Bank, USAID, etc.</li> </ul>



#### OVERVIEW:

Kenya has been actively developing geothermal resources for more than 30, and currently has ~530MW online, making it the 8<sup>th</sup> largest geothermal market in the world.<sup>27</sup> Another 280 MW is under construction at Olkaria and plans are to continue to expand that field. With more than 20 projects or expansions representing over 1,000MW underway, Kenya is poised to become one of the top 3-4 countries in terms of installed capacity in the coming 5-10 years.<sup>28</sup>

For most of this time, geothermal development was led by KenGen, which operates nearly all geothermal plants operating in Kenya . In 2008 the Kenyan Geothermal Development Corporation (GDC) was created with the express purpose of overseeing and to a large extent-carrying out geothermal development in the country. There has been considerable donor and government support dedicated to building the capacity of GDC including the purchase of drilling rigs and development of the steamfield at Menengai. Up until recently, the GDC approach has been focused on full steamfield development and operation, supplying steam to private IPPs, who would design, build, and construct the power plant.. The field at Menengai has been tendered to 3 IPPs, each of whom has been promised 30MW (net) steam for their power plants. To-date, drilling results at Menengai have not been as promising as expected, and concern has been raised in the donor and private sector communities (IPPs, lenders, equity providers) that the steamfield development approach may not be the ideal structure for GDC. In particular, there is concern that the drilling program has been carried out too rapidly without adequate pre-drilling exploration and the development of a robust conceptual mode. Furthermore there appears to be a lack of ongoing data acquisition and analysis that would help to improve drilling success and provide developers with greater security that the reservoir will meet long term requirements for steam delivery. In addition, there is concern that as a new company, GDC may not be fully able to carry out the management of the steamfield, and may not be able to bear the risk associated with guaranteeing steam supply to the IPPs under the current arrangement. Overall, this leads to concerns that the projects at Menengai may not be “bankable” for IPPs looking to obtain project finance. More importantly, it could mean that geothermal MW fail to reach the grid. Donors—JICA and Power Africa in particular—have been working with GDC to address these issues through on-the-job training, workshops, embedded advisors, etc., and other assistance has been provided to help structure steam supply agreements and guarantees to protect investors and developers. Ultimately, if the steamfield is not properly developed and managed, however, no guarantee will be able to deliver steam to power turbines to send electricity to the grid.

Recently, GDC has been exploring other models for resource development, including the concept of a public-private partnership (PPP), in which GDC drills some of the early “discovery” wells and then tenders the concession to a private developer to complete the steamfield development and build and operate the power plant. PowerAfrica, AfDB, and other donors are working to support this model. Of critical importance to its success will be adherence to international standards and industry accepted principals, practices, and methodology for surface and subsurface exploration and drilling, data collection, and analysis. In addition, the structure of the tender will need to include very clear concession rights and development protocol (timing, investment requirements, etc.), and a clear path for permitting, development, PPA negotiation, and financing.

#### Top Priorities:

**Assistance to GDC to determine which development models it can most effectively manage, oversee, and execute.** Donor work should continue to help GDC assess its strengths, identify weaknesses (structural, legal, and human capacity), and understand and manage risks in carrying out geothermal development.

<sup>27</sup> Geothermal Energy Association. “2013 Geothermal Power: International Market Overview”. September 2013.

<sup>28</sup> Ibid.

**Data collection and analysis.** There is a critical need in Kenya to ensure that data from surface and subsurface exploration and drilling in collected and stored in a commonly used format such that it can be used by GDC and private developers in planning drilling campaigns and designing power plants. In addition, without high quality data in a usable format, it is unlikely that the tender process envisioned under the PPP model will yield the desired bid prices for GDC, as developers will be unlikely to pay a premium for the exploration work without access to the data.

**Tendering of drilling rigs.** Numerous rigs have been purchased or leased in recent years to support the rapid development of geothermal, per GoK's development priorities. The tender process has been more focused on price and availability than on adherence to international standards.. In investigating the practices for rig tenders, the author spoke with a representative from a major donor, who informed her that no one from the donor organization or GDC had inspected the most recent rig that had been procured. This individual noted that rig inspection was not the priority, rather a fair and open procurement process focusing on price was the most critical procurement priority. Practices such as these have led to problems at the current drilling sites where rigs are not properly sized for the wells, there is no ability to "course correct" either during the drilling of an individual well, or in redesigning or changing the site, depth, and direction of subsequent wells. The poor tendering situation, combined with the lack of data collection during drilling have likely led to suboptimal drilling results at Menengai (and perhaps elsewhere). Without serious attention to these issues, it is likely that future drilling campaigns will not find the full resource potential.

**PPA pricing to reflect project costs.** There is currently a FIT for geothermal of \$0.088/kWh. For larger resources with minimal issues in drilling (i.e., wells of 5MW or more, minimal dry holes, etc.), this is likely sufficient. It is likely insufficient for most resources. Resources can be deeper (increasing drilling costs), have complicated chemistry (requiring more expensive, customized casing and brine treatment), be smaller (not able to take advantage of scale to spread fixed costs), be far from transmission (requiring expensive transmission lines), or have other complications that lead to increased capital costs for which a tariff of \$0.088/kWh will be insufficient. There needs to be flexibility to adjust the FIT for situations such as those mentioned above, and ERC needs to have the capacity to analyze developer costs (review financial models), and appropriately negotiate tariffs to be cost reflective. Without this flexibility and capacity, many resources may go undeveloped.

**Structuring of tenders/clarity on development process.** As GDC prepares to carry out development through a PPP model, donors are providing assistance to help structure the tender for these resources. Assistance should focus not only on the legal structure of the tender, but also on ensuring that the tender is offered as "packaged" as possible—the resource field is clearly defined (area, potential, etc.), development rights are clear (surface and subsurface, as well as land rights), data is available in a commonly accepted format, permitting requirements are clear and straightforward, development requirements (technical, timing, and financial) are clear and reasonable, and any financing or risk mitigation facilities are spelled out for the potential IPP. This will increase interest from the developer, and likely increase the bid prices submitted for each resource.

Indicator	Notes	Assessment	Priority	Active Donors
1. Preconditions for Market Entry	<p><b>Summary:</b> Kenya has a comprehensive legal framework governing geothermal, including the Geothermal Resource Act of 1982. Roles of the Kenya Power and Light ("Kenya Power"), Kenya Transmission Company ("KETRACO"), Kenya Generating Company ("KENGEN"), Kenya Geothermal Development Company ("GDC") and the Energy Regulatory Commission ("ERC") have clearly defined roles and responsibilities under the Energy Act of 2006.</p> <p>The government has been very vocal about setting goals for geothermal development in the future, and there is significant pressure on GDC to meet these aggressive goals. Significant funds from Gok and donors have been deployed to purchase rigs, and rapidly drill and prove resources with the aim of a) rapidly bringing MW online, and b) de-risking the resource for private IPPs. There are concerns in the geothermal community that this rapid approach to development is not being carried out properly; that wells are being drilled without proper targeting and analysis, data is not being collected for on-site or future analysis, and rigs are being bought and/or hired without proper attention to international best practices rather than simply on least cost..</p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Policy, legal and regulatory framework is generally favorable to IPPs; Kenya booked US\$127 million in private participation in power in 2009; US\$170 million in 2011 and US\$252 million in 2012. Geothermal Resources Act of 1982 and its supplementary legislation of 1990 as well as the Environmental Management and Coordination Act of 1999 with its associated regulations are the legal basis for geothermal power plant implementation in Kenya. There are other laws and regulations that do not directly apply to geothermal but their implications affect geothermal development at various stages and in various ways.</li> <li>Although informal targets have been set by GDC for the installation of geothermal power by 2030, there are no legally mandated renewable portfolio standards; there are a number of tax incentives built into the geothermal law, and tax incentives exist for the import of equipment used in electricity generation plants.</li> <li>Supporting laws for land acquisition and resettlement are unclear or ill-defined in some cases; acquisition can be time consuming and prone to challenges and cost can be substantial.</li> <li>Procurement processes are set forth in two pieces of legislation - The Public Procurement and Disposal Act of 2005, as amended in 2013; and the Public Private Partnerships (PPP), have their own Act, Public Private Partnerships Act 2013 - where procurement processes are set forth for</li> </ul>	Medium	1	IFC PowerAfrica (embedded advisor)

Indicator	Notes	Assessment	Priority	Active Donors
1.2 Government support—Tariff regime	PPPs including the financial and technical qualifications of bidders that are to be taken into account prior to declaring awards.  <b>Summary:</b> Kenya has a FIT for geothermal but its application in practice needs review; at \$0.088/kWh, the FIT appears too low for developers that would be willing to take steamfield development risk. The one-size-fits-all approach means that no reopens are possible for promising geothermal sites that have unusual costs associated with their development (e.g. far from substations, therefore requiring large expenditure for transmission infrastructure; or they could be remotely located, need investment in infrastructure including water and road access; or situated on private land and exposed to rents; or have other unique properties which increase development costs). Finally, under the GDC as steamfield developer model, it is unclear what portion of the tariff will go to GDC (~\$0.02-\$0.03/kWh), if this would be fully cost reflective, and if IPPs would be able to realize a return with the remaining tariff.	Low/Medium	1	
1.5 Contract sanctity	<b>Summary:</b> Kenya ranks 98/189 for protecting investors according to the World Bank “Doing Business 2014” index, which is the second highest (after Rwanda) in the region.	Medium/High	3	
1.3 a Risk mitigation for business and contract risks	<b>Summary:</b> No GOK-sponsored risk mitigation facilities exist; however, GOK laws provide legal backing and enforcement mechanisms for contract sanctity, and Kenya is a current signatory to two main arbitration treaties.	Medium/High	3	
<b>2. Resource Assessment and Capture</b>				
2.1 Surface and sub-surface data	<b>Summary:</b> Geothermal fields in Kenya have been studied and explored for decades. Publicly gathered data is neither robust nor appropriately managed to be “open” to potential private developers. For steamfields that have been drilled by the public sector, minimal if any data exists. Data is generally not collected or analyzed during the drilling period.	Low	1	JICA PowerAfrica (planned)
<b>Detail:</b>				
2.2 Legal framework for concession and development rights	<b>Summary:</b> Public Procurement Oversight Authority ensures transparency of process; however, no clear legally enforceable definition of surface or sub-surface developer rights exists. Because of the current trend toward GDC taking on steamfield development, this has not been a priority. However, GDC is now looking to pursue a joint development approach at Bogoria-Silali. To properly structure the tender, as well as to better address the needs of the private developers currently developing concessions in Kenya, a clearer process for developing geothermal resources will need to be defined.	Medium	1	KfW PowerAfrica

Indicator	Notes	Assessment	Priority	Active Donors
	<p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• Government has granted development licenses to private developers, two of whom are continuing their development efforts.</li> <li>• Developers are encountering major issues with community relations, as local communities continue to extract additional money, jobs, etc. from developers on the threat of shutting down their operations if demands are not met.</li> </ul>			
2.3 Technical knowledge in government agencies	<p><b>Summary: KenGen has over 40 years of experience in geothermal and has operated over 150 MW. GDC was created in 2008 and does not yet have experience in operation (although many of its employees including management and technical specialists come from KenGen). Drilling expertise, steamfield planning, and data gathering are improving, but additional training may be needed.</b></p>	Medium	1	JICA KfW ICEIDA AFD PowerAfrica (planned)
2.4 Strength/Capacity of regulator	<p><b>Summary: ERC serves as the independent regulator, with MOEP oversight.</b></p>	Low/Medium	2	
<b>3. Resource Verification &amp; Early Development</b>				
3.1 Access to finance and risk mitigation products	<p><b>Summary: GOK funds and donor products are available, but few if any sector-specific commercial products exist in the local market. Commercial insurance products are increasingly becoming available, but are limited and relatively expensive, and gaps exist in terms of de-risking the exploration (drilling) phase. Additional financing or risk mitigation mechanisms for private sector production drilling are needed.</b></p> <p><b>Detail:</b> GRMF and ARGeo programs are both available to both the public as well as the private sector and there are ongoing projects funded by both at this time at Silali. GDC has approached the WB to provide funding for exploration, reservoir confirmation drilling and well field development at Pakaa.</p>	Medium	2	AfDB AFD EIB MunichRe (private insurer) JICA KfW China PowerAfrica
3.2 Access to drilling rigs, ancillary drilling services	<p><b>Summary: KenGen and GDC own several rigs, many of which have been purchased with donor funding. Donor grants (AfDB) and GOK funds are available for accessing rigs. Drilling operations are fully integrated; no ancillary service market exists. Drilling service providers are increasingly available in Africa due to increased oil and gas drilling. There is a critical need to improve procurement practices to emphasize compliance with international standards over simply the lowest cost rig or service.</b></p>	Medium/High	1	AfDB AFD
3.3 Clear permitting process	<p><b>Summary: www.renewableenergy.go.ke is the ERC's website describing permits needed for renewable energy projects; though the permit list is contained therein, additional ambiguity</b></p>	Medium	2	PowerAfrica

Indicator	Notes	Assessment	Priority	Active Donors
3.4 Human capital – resource development	<b>exists in the market about how each permit is obtained and the related timelines and costs.</b> <b>Summary:</b> Services and expertise are available locally; developers will likely need to import expertise on most complicated technical issues, but can access local labor for many needs.	Medium/High	2	PowerAfrica
<b>4. Project Financing</b>				
4.1 Credit-worthy off-taker	<b>Summary:</b> KPLC serves as the off-taker for geothermal agreements in Kenya. KPLC has no history of default on PPA obligations. Future obligations imposed on KPLC by the 5000+ MW program may create negative pressure on KPLC's ability to pay, though this will need to be seen. There are risk mitigation mechanisms (partial risk guarantees) available from OPIC, AfDB, etc.	Medium	3	
4.2 Off-take agreement negotiation process / mechanisms	<b>Summary:</b> Off-take agreements are negotiated on an ad hoc basis, but have good past precedents in place to provide expectations for potential developers looking to enter the market and seek financing. KPLC is seeking to standardize the PPA process, and PPAs are generally accepted by lenders. The Feed-in tariff provides clarity on power price; however, it does not recognize the need for higher tariffs for projects that are a) smaller, or b) are remote from necessary transmission or infrastructure.	Medium	1	PowerAfrica
4.3 Human capital – project finance	<b>Summary:</b> At the government level, some personnel have expertise in project development, but it is limited.	Low	2	Iceland AfDB PowerAfrica
<b>5. Construction</b>				
5.1 Construction permitting process	<b>Summary:</b> Construction permitting process is not well-defined.	Low	2	
5.2 Human capital – construction	<b>Summary:</b> Locally available construction resources are limited; however, it is expected that plants would be constructed by EPC contractors able to import or train appropriate resources to meet contractual requirements.	Medium	3	Iceland AfDB
<b>6. Operations</b>				
6.1 Human capital – operations	<b>Summary:</b> Some human capital exists locally for basic operational functions but significant additional training development is needed for a robust local market.	Low	3	



## KENYA PRIORITIZED RECOMMENDATIONS

	0-12 Months Priority 1	12-24 Months Priority 2	24+ months Priority 3
<b>1. Pre-Conditions for Market Entry</b>	<ul style="list-style-type: none"> <li>• Work with GDC on a review of GDC roles vs. capabilities vs. risk</li> </ul>		
<b>2. Resource Assessment and Capture</b>	<ul style="list-style-type: none"> <li>• Technical assistance to improve data collection quality, standardization, and storage/distribution</li> <li>• Technical assistance on concession tendering—overall process, review of GDC role with focus on “bankability” and feasibility of full steamfield development for IPPs</li> <li>• Review of GDC training needs in context of role going forward</li> </ul>	<ul style="list-style-type: none"> <li>• Review of regulator capacity, with a view toward potential assistance in understanding and negotiating geothermal tariffs</li> </ul>	
<b>3. Resource Verification and Early Development</b>	<ul style="list-style-type: none"> <li>• Technical assistance to improve procurement practices for rigs and services to emphasize compliance with international standards</li> </ul>	<ul style="list-style-type: none"> <li>• Design of pilot risk mitigation mechanism for donor-backed private lending or insurance</li> </ul>	
<b>4. Project Financing</b>	<ul style="list-style-type: none"> <li>• Work with KPLC and ERC on tariff setting process and PPA negotiation; focus on understanding unique elements of geothermal projects, and need to adjust tariff to accommodate these aspects</li> </ul>	<ul style="list-style-type: none"> <li>• Training for KPLC, GDC, and ERC on project finance to better understand process, what makes projects “bankable” to lenders, and what role their agencies play in project financing</li> </ul>	
<b>5. Construction</b>		<ul style="list-style-type: none"> <li>• Work to better define and detail construction permit process</li> </ul>	<ul style="list-style-type: none"> <li>• Training of GDC and private workforce on construction</li> </ul>
<b>6. Operations</b>		<ul style="list-style-type: none"> <li>• Work to better define and detail operating permit process</li> </ul>	<ul style="list-style-type: none"> <li>• Training of GDC and private workforce in operations</li> </ul>

# RWANDA



**1 Major Geothermal Fields in Rwanda**  
Source: CIA World Fact Book, author



Estimated Size of Resource:	Studies still on-going; estimated at around 50-100MW
MW Online:	0MW geothermal
Main geothermal fields:	Bugarama, Gisenyi, Karisimbi, Kinigi. Karisimbi now a low priority after dry wells.
Department/Ministry overseeing geothermal:	Ministry of Infrastructure and the Geothermal Development Unit (GDU) of the Renewable Energy Group (formerly EWSA, which was commercialized and is now REG—Rwanda Energy Group (100% government, but with limited commercialization), which is comprised of twin companies: Energy Development Corporation (developer), and the Energy Utility Corporation (distribution and operations; off-taker)
Governing laws:	no current framework guiding geothermal
Regulator:	Rwanda Utilities Regulatory Agency (RURA)
Off-taker:	Energy Utility Corporation (EUC)
Distribution company:	EUC
Generator(s):	None at present. Will be Energy Development Corporation (public sector/government developer); private sector
Private sector activity:	<ul style="list-style-type: none"> <li>None at present but some companies have done evaluation of the potential (Chevron for example spent some time evaluating the resource several years ago.)</li> </ul>
Other projects in development (public sector):	Drilling program at Karisimbi was stopped after drilling results. Future exploration on other fields dependent on outcome of JICA study.
Major donors and their projects:	<ul style="list-style-type: none"> <li>JICA is carrying out a data collection survey, as well as surface/subsurface studies in preparation for Master Plan development</li> <li>EU is providing technical assistance for policy development</li> </ul>

Indicator	Rank (out of 189)	Trend
Starting a Business	9	1 ↓
Dealing with Construction Permits	85	37 ↗
Getting Electricity	53	1 ↓
Registering Property	8	54 ↗
Getting Credit	13	11 ↗
Protecting Investors	22	10 ↗
Paying Taxes	22	3 ↗
Enforcing Contracts	40	--
<b>Overall Rank</b>	<b>32</b>	<b>↑ 22</b>



#### **OVERVIEW:**

Geothermal development in Rwanda is in the early stages. After a disappointing drilling campaign at Karisimbi, donors and the government have shifted their focus from drilling to surface and subsurface studies to better characterize the resources in the country. Both JICA and ISOR carried out surface studies in Rwanda (and JICA has analyzed all the surface and subsurface work done to-date in the country), and both concluded that there are likely commercially-viable resources in the country. The reports prioritized different resources, however.

A peer review of these studies is needed to determine which resource(s) is/are most likely to be commercially viable, and determine the best path forward for exploration. In addition, policy work on tariffs, tax incentives, insurance, financing, etc. is needed as incentives for private investors to enter the market. Should utility scale power generation not be viable, Rwanda should look at direct use applications, assuming resources are close enough to commercial activity.

#### **Top Priorities:**

- Peer review of JICA and ISOR studies to help prioritize resources and chart path forward.
- Fast track assistance to develop the enabling environment for private sector development.
- Workshop and/or technical meeting to discuss the unique aspects of geothermal in the Western Rift zone.
- Other areas for focus may include:
  - Additional assistance to develop geothermal-specific regulations, processes, etc. (should be done in cooperation with the EU). One key area of focus is on the development of a geothermal act and thereafter the concession process and provisions, which is critical for private sector investment
  - Funding for more detailed surface and subsurface work at priority areas identified by JICA study
  - Assistance in building awareness to improve community relations and acceptance of geothermal energy
  - Training and assistance on data analysis and reservoir model development to effectively target and design exploration and production wells (with strong on-the-job component obtained in Kenya or in donor countries)
  - Assistance to the off-taker to reach its goal of becoming self-sustaining by 2017/8

Indicator	Notes	Assessment	Priority	Active Donors
1. Preconditions for Market Entry				
1.1 Government Support – Legal / Policy	<p><b>Summary:</b> After disappointing drilling results at Karisimbi, the Rwandan government has stepped back from geothermal drilling to assess what happened, and to take a more cautious approach to the other resources in the country. The Rwandan government remains cautiously committed to geothermal development, and is working with the EU to develop the proper legal and regulatory environment for geothermal.</p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Current geothermal development activity has been undertaken by MININFRA and EWSA (now Rwanda Energy Group (REG, see below); no concessions for private development have been have yet to be let (and no statutes have been developed for this purpose), but if enacted in the future they would be negotiated and monitored by these entities</li> <li>EWSA was commercialized and is now REG—Rwanda Energy Group (100% government, but with limited commercialization); there are twin companies Energy Development Corporation (developer); Energy Utility Corporation (distribution and operations; off-taker)</li> <li>A comprehensive Geothermal Energy Act and supporting regulations were under discussion in late 2013 and early 2014; draft was done by GDU and reviewed by UNEP (with KenGen support). The support provided was helpful, but largely appropriate to high temperature resources. General consensus is that Rwanda's resources are likely to be lower temperature, and more conducive to binary systems.</li> <li>The EU (through the EUEI-PDF project) is working with the government to develop a strategy for Rwanda, including development of the legal and regulatory framework for geothermal development.</li> <li>An “ESSP”-Energy Sector Strategic Plan is in process that will guide the resource mix for the country. The government wants to phase out thermal power as fast as possible. <ul style="list-style-type: none"> <li>The drilling at Karisimbi went forward as if the existence and size of the resource was guaranteed; in the future, slim holes and shallow wells will be drilled based on more detailed conceptual modeling and well siting and planning prior to full size production wells</li> </ul> </li> </ul>	Medium	1	EU
1.2 Government support—Tariff regime	<p><b>Summary:</b> Feed-in tariff regulations for hydropower were enacted in early 2012; a Fit mechanism for geothermal is supposedly under development, but nothing has been confirmed at this point. Government focus is currently on enacting geothermal law and supporting regulations.</p> <p><b>Summary:</b> Rwanda ranks 32<sup>nd</sup> in the world for ease of doing business. Contract sanctity is high.</p>	Low	2	n/a
1.3 Contract sanctity		High	n/a	

Indicator	Notes	Assessment	Priority	Active Donors
1.3 a Risk mitigation for business and contract risks	<p><i>Issues remain with policy gaps and lack of clarity on tariffs.</i></p> <p><b>Summary:</b> While contract sanctity is high, there are significant policy gaps (lack of clear geothermal framework, no clear tariff regime, etc.), which increase developer risk. Because of the lack of framework, legal recourse is unclear. Mitigation mechanisms are likely limited to donor guarantees and insurance (e.g., OPIC political risk mitigation)</p>	Low		
<b>2. Resource Assessment and Capture</b>	<p><b>Summary:</b> After the drilling results at Karisimbi, surface and subsurface studies have become the priority activity in Rwanda. Reykjavik Geothermal is carrying out a surface study at Bugarama. A comprehensive study funded by JICA will examine data from previous studies and carry out additional work to come up with an estimate of the size, character, and location of geothermal resources in the country. Future work in geothermal will be guided by the results of this study.</p>	Low/Medium	1	JICA
2.1 Surface and subsurface data	<p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Numerous donor-funded surface studies have been carried out. JICA is tracking what studies have been done and what is planned and by whom</li> <li>JICA is a project basis – now developing a master plan including further analysis of geothermal resources potential based on surface geology and geochemistry (this will be completed in October of this year); JICA's master plan will be completed in early 2015. Reykjavik Geothermal (RG) is carrying out work on behalf of the EU (at Bugarama), and is ready to begin shallow drilling (~500M)</li> <li>Data for Karisimbi was collected and is being analyzed prior to the start of future exploration activities; samples have been provided to other foreign experts for analysis as well (this was the first drilling in Western Rift, although very costly, it will hopefully provide valuable information that will be very helpful in terms of the nature of geothermal reservoirs as other areas in the Western Rift are drilled). Such information such as well logs, rock cuttings, temperature data, etc. were all captured.</li> </ul>	Low	2	EU
2.2 Legal framework for concession and development rights	<p><b>Summary:</b> There is currently no clear tender process for geothermal concessions, and the government is keen to avoid unsolicited proposals. The PPP law, once enacted, will govern the tender process. Along with the Investment Act, these will be the key pieces of legislation for foreign geothermal developers in terms of obtaining and developing concessions.</p>	Low	2	
2.3 Technical knowledge in government agencies	<p><b>Summary:</b> Some staff in the Ministry (GDU) and EWSA (now REG) have received training through the UNU-GTP program. REG has considerable staff of over 20 individuals, including geologists, geochemists, geophysicists and hydrologists. Most staff are young and have minimal (if any) on the job experience. Rwanda relies on international experts to fill gaps and</p>	Medium	2	JICA KenGen/GDC

Indicator	Notes	Assessment	Priority	Active Donors
	<p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• Most of the staff at GDU are young people, some with master's degrees in various scientific disciplines; there is for example an experienced geologist focused on surface exploration</li> <li>• For drilling – three master degree holders including a drilling engineers; one trained as a geologist , and three other candidates going to Japan</li> <li>• Also relying on international experts as needed</li> <li>• Specific need at the moment is for a drilling manager and possibly a geophysicist, or reservoir engineer</li> <li>• 9 staff will go to GDC and KenGen for training; people regularly go for in-field experience in Kenya, and spend 1-2 months as regular employees (funded by GOR)</li> <li>• One component of JICA assistance is capacity building of REG/EDC staff</li> </ul> <p><b>Summary: The Rwanda Utilities Regulatory Agency (RURA) is mandated to regulate the electricity and gas sectors, issue licenses to operators, regulate tariffs, and protect customers. The level of experience in the regulator related to ability to develop geothermal ReFTs is unclear. They have one person dedicated to geothermal.</b></p>	Medium	2	EU (potential) GRMF
2.4 Strength/Capacity of regulator				
3. Resource Verification & Early Development				
3.1 Access to finance and risk mitigation products	<p><b>Summary: Financing and risk mitigation is limited to donor assistance. No private financing or insurance exists at the exploration/drilling stage.</b></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• EU is considering providing support to geothermal exploration, but would welcome co-investment from other donors</li> <li>• GRMF funding is available (Rwanda has prepared an application)</li> </ul> <p><b>Summary: For Karisimbi, only one company (from China) responded to the drilling tender. International standards were specified in the tender.</b></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• Drilling rigs were rented; and ancillary services provided by the drilling company at additional cost</li> <li>• All services were provided by one company (vertically integrated Chinese company), which was the only bidder to respond to the EOI</li> <li>• Would welcome collaboration from other countries—potentially using GDC or KenGen rigs if they are appropriate to drill the resources in Rwanda</li> </ul>	Low/Medium	1	EU (potential) GRMF
3.2 Access to drilling rigs, ancillary drilling services		Low	2	

Indicator	Notes	Assessment	Priority	Active Donors
3.3 Clear permitting process	<b>Summary:</b> There is no provision in the current law for permitting geothermal development. The new law (being developed with assistance from the EU) will establish the regulatory framework which will guide the permitting process, including clear laws for exploration, construction permits, environmental impact assessments, etc.	Low	1	EU
3.4 Human capital – resource development	<b>Summary:</b> See above(2.3) Rwanda is making a significant effort to gain experience and expertise and is actively reevaluating how to site wells and plan drilling operations. Closer interaction between Kenya, Uganda, Rwanda also help support human capital needs at a regional level	Medium	1	
<b>4. Project Financing</b>				
4.1 Credit-worthy off-taker	<b>Summary:</b> The off-taker is the newly created EUC, which has no direct track record or balance sheet. Power prices are currently subsidized, which means that a sovereign guarantee and/or partial risk guarantees from donors will be required. There is a plan for EUC to become self-sustaining by 2017/18 through the introduction of cost reflective tariffs.	Low/Medium	1	
	<b>Detail:</b>			
	<ul style="list-style-type: none"> <li>RURA sets the subsidy level. Currently, power prices are about 1/3 subsidized.</li> <li>Sovereign guarantee will be needed initially; this has been provided in the past for other projects</li> <li>AfDB can provide PRGs in Rwanda</li> <li>Eventual subsidies could be targeted to low-income customers if needed</li> <li>Currently 1/3 is subsidy, remainder tariff</li> </ul>			
4.2 Off-take agreement negotiation process / mechanisms	<b>Summary:</b> Standard PPAs exist and have to be approved by MININFRA and agreed to by RURA; currently there is little/no experience in preparing PPAs specific to geothermal development.	Low/Medium	3	
	<b>Detail:</b>			
	<ul style="list-style-type: none"> <li>REG has experience in negotiating PPAs with IPPs, but no specific geothermal experience.</li> <li>PPA – Methane, Solar, and Peat; The EU is looking to adapt this for geothermal</li> <li>Hydro has a standard PPA for up to 10MW because there is a FIT</li> <li>Collaboration between Rwanda Development Board</li> </ul>			
4.3 Human capital – project finance	<b>Summary:</b> In general, expertise in project finance/PPA negotiation is strong, but geothermal specific experience is lacking. There is a national capacity building initiative aimed at addressing capacity gaps.	Medium	1.5	
	<b>Detail:</b>			
	<ul style="list-style-type: none"> <li>Support from international experts; this area is growing</li> </ul>			

Indicator	Notes	Assessment	Priority	Active Donors
	<ul style="list-style-type: none"> <li>• There is also a process to obtain legal support through the African Legal Support Facility (ALSF)</li> </ul>			
<b>5. Construction</b>	<b><i>Clear laws exist for construction permitting, but not specifically for geothermal</i></b>	Low	3	
5.1 Construction permitting process		Low	3	
5.2 Human capital – construction		Low	3	
<b>6. Operations</b>	<b><i>No direct geothermal expertise</i></b>	Low	3	
6.1 Human capital – operations		Low	3	

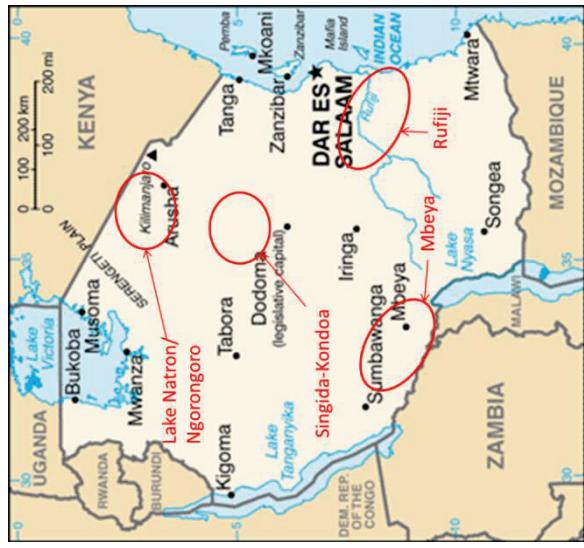


## RWANDA PRIORITIZED RECOMMENDATIONS

	0-12 Months	12-24 Months	24+ months
	Priority 1	Priority 2	Priority 3
<b>1. Pre-Conditions for Market Entry</b>	<ul style="list-style-type: none"> <li>Development of geothermal law and policy framework</li> </ul>		
<b>2. Resource Assessment and Capture</b>	<ul style="list-style-type: none"> <li>Completion of current surface and subsurface exploration (JICA)</li> <li>More detailed subsurface exploration, reservoir modeling and well targeting at priority areas</li> <li>Development of clear process for tendering concessions</li> </ul>	<ul style="list-style-type: none"> <li>Assistance to regulator to develop geothermal capacity</li> </ul>	
<b>3. Resource Verification and Early Development</b>	<ul style="list-style-type: none"> <li>Development of permitting process for exploration and development</li> <li>On-the-job training for drilling (regional exchange with GDC)</li> <li>Additional funding to augment EU funding for geothermal development/drilling</li> </ul>	<ul style="list-style-type: none"> <li>Assistance with rig tendering process and/or development of agreements/process to lease rigs from KenGen or GDC</li> </ul>	
<b>4. Project Financing</b>	<ul style="list-style-type: none"> <li>Assistance to off-taker to become self-sustaining by 2017/8</li> </ul>	<ul style="list-style-type: none"> <li>Capacity building for geothermal-specific project finance and tariff setting.</li> <li>Assistance in developing PPA for geothermal</li> </ul>	<ul style="list-style-type: none"> <li>Continue to update in skills assessment; no immediate action or planning priorities</li> </ul>
<b>5. Construction</b>			<ul style="list-style-type: none"> <li>Continue to update in skills assessment; no immediate action or planning priorities</li> </ul>
<b>6. Operations</b>			<ul style="list-style-type: none"> <li>Continue to update in skills assessment; no immediate action or planning priorities</li> </ul>

# TANZANIA

**2 Major Geothermal Fields in Tanzania**  
Source: CIA World Factbook, JICA, Author



Estimated Size of Resource:	Studies still on-going; estimates ~650-680MW
MW Online:	0 MW geothermal
Main geothermal fields:	Lake Natron/Ngorongoro, Mbeya, Rufiji, Singida-Kondoa
Department/Ministry overseeing geothermal:	Ministry of Energy and Minerals, Geothermal Task Force, newly created Tanzanian Geothermal Development Corporation
Governing laws:	no current framework guiding geothermal; was under mining law, but now awaiting new regulations for geothermal
Regulator:	Energy and Water Utilities Regulatory Authority (EWURA)
Off-taker:	Tanesco
Distribution company:	Tanesco
Generator(s):	None for geothermal
Private sector activity:	Geothermal Power Tanzania (GPT) was actively involved in developing a concession at Ngozi, but this concession as well as all others have been revoked.
Other projects in development (public sector):	TGDC is newly formed. AfDB, through the SREP program is looking to support exploration/reservoir confirmation drilling at key locations in Mbeya.
Major donors and their projects:	<ul style="list-style-type: none"> <li>• JICA recently finalized a data collection survey</li> <li>• BGR finished subsurface studies</li> <li>• AfDB (through SREP) will use the JICA and BGR work to target exploration wells</li> <li>• AfDB is planning to provide technical assistance for policy development</li> <li>• DFID (EAGER) planning assistance to TGDC</li> <li>• World Bank (ESMAP) considering assistance program</li> </ul>

Indicator	Rank (out of 189)	Trend	Key Indicators from World Bank "Doing Business 2014"	
			2013	2014
Starting a Business	119	4 ↓	119	119
Dealing with Construction Permits	177	--	177	177
Getting Electricity	102	--	102	102
Registering Property	146	6 ↓	146	146
Getting Credit	130	4 ↓	130	130
Protecting Investors	98	3 ↓	98	98
Paying Taxes	141	1 ↓	141	141
Enforcing Contracts	42	1 ↓	42	42
<b>Overall Rank</b>	<b>145</b>	<b>9 ↓</b>	<b>145</b>	<b>145</b>





#### **OVERVIEW:**

The Government of Tanzania (GoT) has made a strong commitment to addressing the critical power shortage within the country. Its top priorities are currently gas, followed by coal, hydropower, and renewable energy. As such, it is unclear that geothermal energy is a true priority. Discussions with officials at the Ministry of Energy and Minerals (MEM) however, indicate that geothermal is, in fact, a priority, with both the Minister and the Permanent Secretary openly stating that they would like to see geothermal exploratory drilling start within the next 12 months. Furthermore, GoT recently created the Tanzanian Geothermal Development Corporation (TGDC), which will be in charge of geothermal development in the country. It should be noted, however, that geothermal experts (donors, consultants, etc.) consulted under the auspices of the development of this strategy are concerned that TGDC will be a copy of GDC in Kenya, which is likely inappropriate for the smaller geothermal potential in Tanzania. Developing an organization with the size and scope of GDC in a country with 10% of the resource potential has the potential to be a waste of resources both financial and human.

While these actions are promising in terms of demonstrating commitment to geothermal, there is currently no regulatory framework for geothermal development; private development has been halted due to the revocation of concessions and it is unclear what level of commitment GoT will make to the development of TGDC.

Many of these outstanding questions and issues are set to be answered through the SREP program being carried out by the African Development Bank (AfDB). Under this program, AfDB will dedicate \$700,000 to technical assistance for policy development and capacity building within the relevant institutions focused on geothermal exploration, development and regulation. Further, up to \$25 million will be allocated for subsurface studies and exploration drilling. An additional \$30 million will be reserved for financing geothermal projects in the future. However this is only approximately 10-15% of the total cost of a 100 MWe geothermal power station.

Other donors are taking a wait and see approach to their activities in geothermal, preferring to let the AfDB better define and carry out their program before determining where they can best provide additional assistance and financing. There is concern in the donor community that the AfDB program has been developed in absence of coordination with the donor community, and the program may not fully benefit from the work done to-date. The AfDB maintains that donors will be consulted during the project appraisal phase; after the recruitment of consultants to prepare the geothermal energy development strategy, legal and regulatory framework, and project related documents.

The lack of legal framework has left progress on geothermal energy development in Tanzania at a standstill. Progress that was made by the private sector has been halted because of the government decision to revoke all concessions issued under the Mining Law. Further, GoT seems to want to wait until the geothermal policy is fully developed before revisiting the concession tendering process. Finally, GoT has indicated that the role of the private sector may be further restricted, as they look for TGDC to take the lead on geothermal development with the intent of de-risking resource confirmation and drilling and expediting the development process. Given the lack of staffing, and the time required to develop skills and experience in geothermal exploration, it is unlikely that TGDC taking over development will serve to either de-risk resource exploration and drilling or expedite development.

#### **Top Priorities:**

A sound approach to jump starting geothermal development would involve a) developing policy and conducting exploration activities in parallel, rather than waiting for policy development, and b) providing assistance to TGDC to determine the appropriate role for the entity, staff up appropriately. In addition, efforts by the donor community to coordinate with the AfDB, and possibly augment, or “top up” their drilling facility could be useful in terms of expediting geothermal exploration in the country.

- Policy development—in coordination with the AfDB program under SREP, work with MEM to develop a legal and regulatory framework for geothermal. Emphasis should be on the concession tendering process and concession provisions, in order to resolve the outstanding issues with private developers, and to demonstrate to the private sector that Tanzania is committed to private sector involvement in geothermal development.
- Assistance to TGDC—in parallel with the policy development efforts, a key focus for donors should be TGDC. It is critical that TGDC develop a proper structure and identify its core functions up front, so that the appropriate capacity building efforts can be undertaken, and the private sector can understand the opportunities available, and the role that the government will play in development.

In determining the proper role for GDC, GoT and donors alike should avoid simply replicating the GDC model of full steamfield development in Kenya. A program of that size and scale is beyond the current needs or capacity of TGDC. Developing and managing geothermal steamfields is risky and capital intensive, and requires years of capacity development to manage properly.

Indicator	Notes	Assessment	Priority	Active Donors
1. Preconditions for Market Entry	<p><b>Summary:</b> The Government of Tanzania's top priorities for energy development are 1) Gas, 2) Coal, 3) Hydro, and 4) Renewable Energy (including geothermal); however, both the Minister and Permanent Secretary at the Ministry of Energy and Minerals (MEM) have indicated that they are in support of the rapid development of geothermal. The existence of an active geothermal task force, as well as the recent creation of the Tanzanian Geothermal Development Corporation (TGDC) seems to indicate that the government is serious about developing geothermal.</p> <p>In terms of policy, however, there is currently no renewable energy policy. In fact, the government is in the process of reviewing the national energy policy (the latest is from 2003). Once revisions to this policy are made, the renewable energy act will follow, which will include regulatory environment and strategy for geothermal.</p> <p>The government is interested in leading geothermal develop to help de-risk resources for the private sector (and to speed up the process—there is clear frustration with the pace of development), and is not issuing more licenses to the private sector at this time.</p> <p><i>Detail:</i></p> <ul style="list-style-type: none"> <li>No specific geothermal act or regulatory framework is in place; concession and development was guided by the mining law until MEM decided this policy was insufficient resulting in a revocation of all existing concessions and putting the granting of new licenses on hold until the geothermal policy is developed.</li> <li>A National Task Force on Geothermal Development was formed to advise on the geothermal energy act, and oversee the development of geothermal in the country. Members include MEM, Tanesco, Geological Survey of Tanzania, Private Sector, and GDC.</li> <li>Natural gas is a much higher priority for the government at this time. Geothermal is a priority, but it takes a long time to develop. Tanzania has a critical power shortage, so gas is a priority for now. Hydro is becoming less of a priority because there is a water shortage and is therefore unpredictable.</li> <li>The 25-year Power System Master Plan, last updated in 2012, identifies some potential geothermal sites. The next 25-year plan is anticipated to include 100MW of geothermal development for the post-2025 period, over 10 years away. <ul style="list-style-type: none"> <li>Actual 2012 PSMP language on geothermal: "There is insufficient information to consider</li> </ul> </li> </ul>	Low	1	AfDB SIDA

Indicator	Notes	Assessment	Priority	Active Donors
	<p>a geothermal option in the generation expansion plan under the current PSMP review. However, given the importance of using Tanzanian resources, the coming comprehensive PSMP update could include up to 100 MW of geothermal's as a candidate starting in 2025 in anticipation that confirmatory studies will have been completed. A Task Force for Geothermal Energy Development has been formed, but it has no decision-making power, and is only able to provide advice to the Minister. The overall mandate of the Geothermal Energy Task Force is to ensure the expansion of the generation of green/clean energy.”</p> <ul style="list-style-type: none"> <li>“PSMP baseline plan has a limited role for renewable energy (large hydro), reflecting inadequate data and unavailable power planning methods that could more effectively integrate a wide range of renewable energy options, especially distributed generation.”</li> </ul> <p>[Source: SREP]</p> <ul style="list-style-type: none"> <li>Geothermal is not listed as a priority technology in “Big Results Now” plan (Energy Lab Report)</li> </ul>			
1.2 Government support— Tariff regime	<p><b>Summary:</b> <i>Feed-in tariffs are available for small, renewable power producers of up to 10MW, calculated based on avoided costs; in 2012 avoided cost was set to USD \$0.09/kWh for grid-connected and USD \$0.30/kWh for rural mini-grid areas. No specific Renewable energy feed-in-tariff (FIT) exists for geothermal energy.</i></p>	Low	2	
1.3 Contract sanctity	<p><b>Summary:</b> <i>The process for awarding concessions was, until 2013, guided by the mining law. Through this process, a number of developers have been awarded geothermal concessions. Stating its desire to issue licenses through a competitive tender process under a geothermal law/framework (not yet developed), the government revoked all private concessions.</i></p> <p><b>Detail:</b> Geothermal Power Tanzania (GPT) had its concession revoked, despite having invested over \$2 million in surface and subsurface exploration. MEM officials indicate that GPT was not in compliance with reporting and development requirements, and therefore revoked the concession. GPT's appeal to the MEM (giving evidence of its compliance) was denied. It is unclear under what terms (if any) the concession could be reinstated.</p> <p>Other concessions that were revoked had remained idle for over 10 years. It is believed that these concessions were obtained by individuals or companies that never intended to develop the resource, but were speculating that they would be able to sell the concessions at a later date. This is one key reason MEM has given for revoking the concessions and drafting a new policy that will more appropriately define the terms of the concession, rental payments and due diligence requirements.</p> <p><b>Summary:</b> <i>The revocation of the GPT concession has damaged the private sector perception of</i></p>	Low	1	
1.3 a Risk mitigation		Low	1	

Indicator	Notes	Assessment	Priority	Active Donors
for business and contract risks	<b><i>the potential for geothermal development in Tanzania. The appeal process was not viewed as fair, and it is unclear what legal recourse is available in the Tanzanian courts.</i></b>			
2. Resource Assessment and Capture	<b><i>Summary: Basic surface studies were carried out on over 50 sites in the 1970s. Only the southwestern zone has undergone detailed surface exploration studies. In 2006 and 2010, the MEM, in collaboration with the Geological Survey of Tanzania (GST), the German Federal Institute for Geosciences and Natural Resources (BGR), and TANESCO, carried out surface exploration and conducted detailed studies in the Ngoro-Songwe prospect in the Mbeya region.</i></b>	Medium	1	JICA BGR AfDB
2.1 Surface and subsurface data	<p><b><i>Detail:</i></b></p> <ul style="list-style-type: none"> <li>• A surface study carried out by Sweden (funded by AfDB) in 2003-5 as part of the rural electrification program ranked the geothermal areas by resource potential</li> <li>• The 2006-9 study carried out by BGR and GoT involved geology, geochemistry, and geophysics on key sites and recommended further subsurface studies (MT &amp; TEM)</li> <li>• The 2010-2012 study by BGR involved MT&amp;TEM, and involved reservoir modeling and identification of preliminary drilling targets for temperature gradient holes and exploration wells</li> <li>• TGDC will work with BGR to determine the next steps in the exploration process</li> </ul>	Low	1	
2.2 Legal framework for concession and development rights	<b><i>Summary: See 1.3 above.</i></b> <b><i>Now that there is no governing law, MEM has said that a private sector developer would have to negotiate an MOU with TGDC if they wanted to develop a concession.</i></b>		1	
2.3 Technical knowledge in government agencies	<b><i>Summary: There are qualified individuals within MEM, as well as in the Geological Survey of Tanzania (GST). The newly created TGDC has little staff and minimal expertise. It is unclear how this new entity will be staffed, but it is likely to need significant capacity building.</i></b>	Low	1	
	<p><b><i>Detail:</i></b></p> <ul style="list-style-type: none"> <li>• Low awareness of geothermal potential within the government; the Ministry of Energy and Mineral Resources has a Renewable Energy Section, which has a geothermal subsection.</li> <li>• Staff from geothermal department have received training from Iceland and/or New Zealand</li> <li>• Staff in the Geological Survey department within the Ministry have some competence in geothermal energy development.</li> </ul>			
2.4 Strength/Capacity of regulator	<b><i>Summary: The Energy and Water Utilities Regulatory Authority (EWURA) is responsible for licensing and tariff reviews, and also for health, safety and environmental reviews. EWURA is generally viewed as strong and capable, and worked with Tanesco to pass a 40% tariff increase in the lead up to an election year. EWURA has no experience in geothermal.</i></b>	Low/Medium	3	

Indicator	Notes	Assessment	Priority	Active Donors
	<p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>In the past two years, GoT has revised the tariff upward twice in 2013 and 2014 for a total increase of approximately 40%, based on EVURA's (regulator) recommendations.</li> </ul>			
<b>3. Resource Verification &amp; Early Development</b>				
3.1 Access to finance and risk mitigation products	<b>Summary:</b> Access to finance and risk mitigation mechanisms is limited to those provided by donors (currently AfDB through the SREP program), REA has developed matching grant support programs for small scale renewable projects, which could potentially be applied to utility scale geothermal. Access to finance locally is very limited/non-existent.	Low	2	
3.2 Access to drilling rigs, ancillary drilling services	<b>Summary:</b> Donor assistance from AfDB and BGR is addressing this issue. Drilling rigs as well as drilling support providers are increasingly available in the region.	Low/medium	2	AfDB
3.3 Clear permitting process	<b>Summary:</b> Permitting and development process is "complex" and "bureaucratic" according to SREP report, which also notes that renewable projects are new to Tanzania and still being developed, streamlined, etc. Some more efficient processes have been developed under the Rural Energy Agency (REA). Additional guidance should come under the renewable energy act.	Low	2	
3.4 Human capital – resource development	<b>Summary:</b> Capacity in drilling and subsurface exploration is quite limited. If TGDC intends to carry out any type of drilling or subsurface work, this will need to be addressed in the very short term.	Low	1	
<b>4. Project Financing</b>				
4.1 Credit-worthy off-taker	<b>Summary:</b> Tanesco, the off-taker, is currently going through a restructuring to split it into 3 companies for generation, transmission, and distribution. At the same time, it will be recapitalized to help it remain solvent. While it has been in financial difficulty for some time due to tariff subsidies, it was able to work with EWURA to raise tariffs 40% in the last two years, bringing them closer to being cost reflective.	Low/Medium	3	
4.2 Off-take agreement negotiation process / mechanisms	<b>Summary:</b> Standardized PPAs exist for small renewables (up to 10 MW), but no specific agreements exist for geothermal. Some PPAs denominated in TZS, causing currency risk	Low/Medium	2	
4.3 Human capital – project finance	<b>Detail:</b>			
5. Construction	<b>Summary:</b> Experience exists for other technologies, but not for geothermal specifically	Low	2	
5.1 Construction	<b>Summary:</b> No specific process for geothermal. This should be addressed in the geothermal	Low	3	

Indicator	Notes	Assessment	Priority	Active Donors
permitting process	<i>regulations under the renewable energy act.</i>			
5.2 Human capital – construction	<i>Summary: Capacity is very limited, especially in remote areas for both design and construction.</i>	Low	3	
<b>6. Operations</b>				
6.1 Human capital – operations	<i>Summary: No operational experience</i>	Low	3	

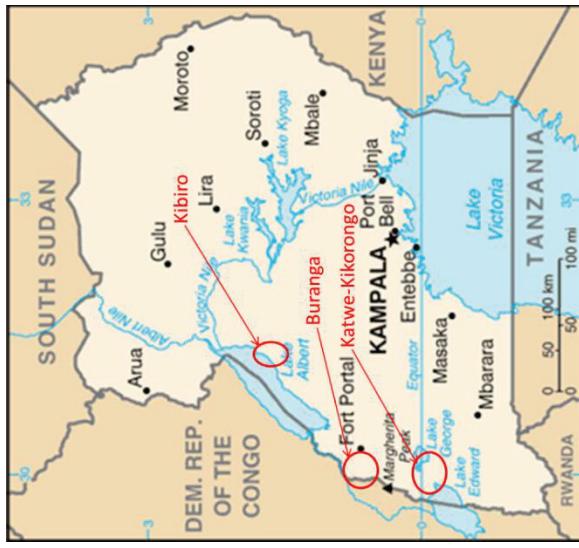


## TANZANIA PRIORITIZED RECOMMENDATIONS

	0-12 Months	12-24 Months	24+ months
	Priority 1	Priority 2	Priority 3
<b>1. Pre-Conditions for Market Entry</b>	<ul style="list-style-type: none"> <li>Development of legal and regulatory framework for geothermal</li> </ul>	<ul style="list-style-type: none"> <li>Technical assistance to examine development of FIT for geothermal</li> </ul>	
<b>2. Resource Assessment and Capture</b>	<ul style="list-style-type: none"> <li>Development of concession application/tender and development process</li> <li>Technical assistance to GDC to determine structure and functions</li> </ul>		<ul style="list-style-type: none"> <li>Assistance to regulator on development of tariffs for geothermal</li> </ul>
<b>3. Resource Verification and Early Development</b>	<ul style="list-style-type: none"> <li>Technical assistance to TGDC to build capacity in surface and subsurface exploration, reservoir modeling, and drilling and well testing</li> </ul>	<ul style="list-style-type: none"> <li>Technical assistance to clearly delineate permitting process for drilling and exploration</li> <li>Potential “topping up” of AfDB SREP facility for exploration drilling</li> </ul>	
<b>4. Project Financing</b>		<ul style="list-style-type: none"> <li>Training on geothermal project finance</li> <li>Development of PPA template for geothermal; denominated in hard currency</li> </ul>	
<b>5. Construction</b>			<ul style="list-style-type: none"> <li>Continue to update in skills assessment; no immediate action or planning priorities</li> </ul>
<b>6. Operations</b>			<ul style="list-style-type: none"> <li>Continue to update in skills assessment; no immediate action or planning priorities</li> </ul>

# UGANDA

**3 Major Geothermal Fields in Uganda**  
Source: CIA World Fact Book, author



## Key Indicators from World Bank “Doing Business 2014”

Indicator	Rank (out of 189)	Trend
Starting a Business	151	5 ↓ 13 ↓
Dealing with Construction Permits	143	
Getting Electricity	178	1 ↓
Registering Property	126	2 ↓
Getting Credit	42	2 ↓
Protecting Investors	115	2 ↓
Paying Taxes	98	2 ↓
Enforcing Contracts	117	3 ↓
<b>Overall Rank</b>	<b>132</b>	<b>11 ↓</b>

Estimated Size of Resource:	Studies still on-going; estimates ~400MW
MW Online:	0MW geothermal
Main geothermal fields:	Katwe-Kikorongo, Kibiro, and Buranga fields
Department/Ministry overseeing geothermal:	Ministry of Energy and Mineral Development, which created a geothermal department in July 2014
Governing laws:	Mining Act
Regulator:	Electricity Regulatory Agency (ERA)
Off-taker:	Uganda Electricity Transmission Company Limited (UETCL)
Distribution company:	Uganda Electricity Distribution Company Limited (UEDCL); about 30 total companies in Uganda
Generator(s):	no generation to-date
Private sector activity:	<ul style="list-style-type: none"> <li>AAE , a US-owned EPC company, owns 152km<sup>2</sup>Kasese concession in the Katwe-Kikorongo area, inside of Queen Elizabeth National park. Pre-feasibility study has been completed (shallow wells only), AAE has obtained a PPA from ERA. Preliminary results indicate potential for 150MW.</li> <li>Pawakom (Ugandan-owned)</li> <li>Clean Energy (US/Uganda joint venture)</li> <li>Private developer (GIDS Consult) (Ugandan owned)</li> </ul>
Other projects in development (public sector):	Government is carrying out surface and subsurface studies throughout the country
Major donors and their projects:	<ul style="list-style-type: none"> <li>JICA is carrying out a data collection survey</li> <li>EU is providing technical assistance for policy development</li> <li>World Bank developing plan to create a government entity to oversee geothermal, and assist on development of a geothermal law. Target start date: Q1 2015</li> </ul>



#### **OVERVIEW:**

Geothermal development in Uganda is still in the very early stages, and is focused on surface and subsurface studies, which are being carried out by the government, donors, and the private sector. The legal and regulatory environment for geothermal is currently governed by the Mining Act, which is inadequate for geothermal, particularly in terms of the time allowed for exploration, due diligence requirements, as well as the process for private sector developers to sell steam. For private sector developers, Uganda is a difficult environment in terms of general rule of law and contract sanctity. For American companies governed by the Foreign Corrupt Practices Act (FCPA), the environment is particularly challenging. Good governance in Uganda needs to be in place in order for developers to feel comfortable taking on the technical and financial risks inherent in geothermal development. In spite of the unfavorable macro environment, there are a number of private developers in Uganda at various stages of development, including one that has signed a PPA.

Human capacity within the government to govern and carry out the development of geothermal is growing for early stage exploration and development. Some gaps exist in terms of geophysical expertise and experience, as well as general on the job experience in all areas of exploration-surface as well as subsurface. Drilling experience relative to both actual drilling as well as regulating drilling is minimal

At this early stage of development in Uganda, the keys areas of focus should be on surface and subsurface exploration (with commensurate data collection and analysis), and developing the legal and regulatory environment. Capacity building for surface and subsurface exploration is key, but may not be critical for later phases of development depending on the development policies adopted in the country. Until the resource potential is better known, regional cooperation and sharing of expertise and equipment is a more prudent course of action. Once there is a clearer picture of the geothermal potential in Uganda (and assuming the potential is high and government support exists), donors and the government can look toward developing in-country expertise for all phases of geothermal development.

#### **Top Priorities:**

- Assistance to newly created geothermal department to determine structure and build technical and administrative capacity. The World Bank is currently designing a project to this effect.
- Assistance with drafting geothermal law. The World Bank project also focuses on this. Future assistance on key implementing regulations, permitting processes, etc., may be necessary in the near future.
- Completion of surface and subsurface exploration, complete with robust data collection and analysis and making such information available to potential private developers and financiers.
- Capacity building in conducting geophysical surveys and interpretation of results. The government is looking to procure equipment to conduct geophysical surveys, and will need training to carry out the surveys, collect, analyze, and interpret the data.

Indicator	Notes	Assessment	Priority	Active Donors
<b>1. Preconditions for Market Entry</b>	<p><b>Summary:</b> The Government of Uganda has publicly indicated its support for renewable energy through the 2002 and 2007 Renewable Energy Policy, but has not set forth specific geothermal targets. In general, hydropower is favored over geothermal, but recent progress in Kenya (and subsequent collaboration between Uganda and GDC have raised geothermal's profile as a priority renewable energy source.</p> <p>Recent government initiatives have included the creation of a consolidated department for geothermal within the Ministry of Energy and Mineral Development, and the drafting of a geothermal act. Currently, geothermal is governed by the Mining Act of 2003, which has hindered private sector development.</p> <p><b>Details:</b></p> <ul style="list-style-type: none"> <li>• The 2002 Energy Policy and 2007 Renewable Energy Policy both mention targets for renewables to reach 61% by 2017, but there is no specific mention of geothermal targets</li> <li>• Geothermal exploration falls under the Mining Act of 2003, and electricity generation follows the Renewable Energy Policy of 2007</li> <li>• Effective 1 July 2014, the Department of Geothermal Resources was established; according to the Ministry, staff recruitment is beginning in October of this year, and all positions within the Ministry should be filled before year end</li> <li>• Key focus for this department (and its predecessor) is on surface and subsurface exploration</li> <li>• A geothermal act is currently being drafted, which will also include all regulations and policies governing geothermal. Ministry aims to have this in place within 12-18 months.</li> <li>• Lack of clear geothermal policy (and the complications of being governed by the Mining Act) has been a clear stumbling block for private developers. <ul style="list-style-type: none"> <li>○ The Mining Act only allows for an exploration period of 3 (three) years, with two, two-year renewals possible. Developers argue that 3 years is insufficient in geothermal, and the renewals are left to the discretion of the Ministry and therefore hard to predict. As such, developers are not comfortable including the renewal periods in their project planning.</li> <li>○ The process for obtaining a concession through the Mining Act is a first-come, first served application process. This has led to a number of concessions being granted to unqualified parties who are only looking to sell the concessions at a premium, not develop them. As a result, a number of concessions have remained idle for years.</li> </ul> </li> <li>• Communication of government actions, priorities, and policies to donors and developers</li> </ul>	Low/Medium	1	EU World Bank

1.2 Government support—Tariff regime	<p>shows room for improvement.</p> <p><b>Summary:</b> The government (through the regulator, ERA) has put in place Feed in Tariffs (FIT) for small scale (&lt;20MW) renewable energy, including one for geothermal. For larger (utility-scale) development, tariffs will have to be negotiated. Tariffs in Uganda are currently in the range of \$0.07-0.11/kWh for existing forms of energy.</p> <p><b>It is unclear how committed the government is to private sector development of geothermal (as opposed to public-sector led exploration and development); therefore, it is also unclear what level of support exists to set or agree to higher tariffs for geothermal developers.</b></p> <ul style="list-style-type: none"> <li>ERA has developed guidelines for renewable energy feed-in tariffs, which include a geothermal feed-in tariff for generation up to 20 MW at USD \$0.077/kWh; however, this tariff does not adequately consider the costs for exploration, reservoir confirmation drilling, well field development drilling, and long term steam field management.</li> <li>There is a program called “GetFit”, which provides an additional \$0.01-0.02/kWh to better cover the costs of development for small scale renewable projects (wind, solar, hydro).</li> <li>Currently, government allows private developers to develop cost model and requested rates that demonstrate a market rate of return. <ul style="list-style-type: none"> <li>One PPA has been signed.</li> <li>Developers are working on assumption/provision in guidelines that you can renegotiate your rate once the information is more set</li> </ul> </li> </ul>	Low/Medium	1.5	KfW (for small scale)
1.3 Contract sanctity	<p>It is becoming increasingly difficult for American companies to do business in Uganda. Geothermal is inherently risky and expensive; and the good governance piece in Uganda needs to be resolved in order to be competitive. American companies must abide by FCPA; powerful actors can hijack projects in the current state. Uganda ranks 132/189 in the World Bank “Doing Business” guide for 2014.</p> <ul style="list-style-type: none"> <li>None currently available. Legal recourse is unclear.</li> </ul>	Low	1	
1.3 a Risk mitigation for business and contract risks	<h2>2. Resource Assessment and Capture</h2> <p><b>Summary:</b> Considerable surface work has been done on at least 4 sites, including subsurface work (temperature gradient holes and geophysics). These fields are reasonably well defined. The government continues to prioritize surface and subsurface exploration as a way to both determine the geothermal potential in the country, as well as to attract the private sector.</p> <p><b>Developers indicate that the data collected by the government is easily accessible and of high</b></p>	Low/Medium	1	JICA GDC (Kenya)
2.1 Surface and subsurface data				

<ul style="list-style-type: none"> <li>• Uganda has an MOU with GDC (Kenya) to collaborate on resource exploration and development           <ul style="list-style-type: none"> <li>• At the government level, geology and geochemistry, is available for some resources, while with geophysical data is only available for a few selected sites</li> <li>• All information generated by government is free to be shared; private developers can access from geological survey information free of charge. For geophysical raw data,,, ministry charges a fee to access.</li> <li>• Private developers must share data with government each quarter and vice versa. This data is not shared publicly to protect the private investors. Information is made public if the concession is revoked or relinquished</li> <li>• Government currently in the process of procuring equipment to conduct gravity and electromagnetic surveys (geophysics)</li> </ul> </li> </ul>	<p><b>Summary:</b> Licenses for geothermal are issued by the Ministry of Energy and Mineral Development, and are governed by the Mining Act. Licenses are granted by the Geological Survey Department on a first come, first served basis. The process for granting concessions is considered clear, fair, and reasonable; however, issues related to land rights, reporting, and time allowed for exploration create problems for developers. There are certain aspects of the Mining Act that are either not applicable to, or directly in conflict with geothermal exploration and development.</p> <p><b>Furthermore, the department has demonstrated past weaknesses in revoking licenses when concessionaires did not fulfill the obligations under their licenses in mineral mining, so there is a risk that similar challenges will exist with geothermal development.</b></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• Mineral leases are actually well defined and quite secure, but they do not work well for geothermal development.</li> <li>• Much of the land is already leased for mineral exploration and thus not open for geothermal concessions (two concessions on one land parcel are not permitted, even if for different purposes)</li> <li>• Currently, the land act is superior to the mining act, so even though a concession includes surface rights (in addition to subsurface), developers must work with landowners to negotiate rights to develop on the surface</li> <li>• Government has the ability to invoke eminent domain, but encourages private developers to</li> </ul>
	<p>quality. It is unclear which resources have available data.</p>

<ul style="list-style-type: none"> <li>The government is the main landowner in the major geothermal areas, so private land issues/negotiations are minimal</li> <li>At the local level, applications must be registered with the Chief Administrative Officer of district (CAO)</li> <li>Right now granted on first come first served basis; if you are rejected; the CAO has the power to take up another application while you are rectifying and resubmitting</li> <li>Currently application must include quarterly planning and include financial documentation which is to be followed upon award of the concession</li> </ul>	<p><b>Summary:</b> <i>The Geological Survey Department in the Ministry of Energy and Minerals Development is responsible for geothermal licensing, exploration and development; Staff from the Department have attended many seminars and workshops on geothermal development, and are viewed as quite competent in geological/geothermal exploration. The biggest need relative to resource exploration is training for geophysicists in conducting geophysical surveys and in the interpretation of the data.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>In the past 20 years, staff in Ministry (geologists, geochemists) has been training in Kenya and Iceland (ICEIDA); government is currently working on an MOU with GDC for staff exchanges.             <ul style="list-style-type: none"> <li>In the short run, Uganda will send 6 persons to focus on surface exploration - MT TEM</li> </ul> </li> <li>Biggest challenge is geophysics, both in conducting geophysical surveys and in the interpretation of the data. The government is procuring geophysical survey equipment, and staff will need training on its use and application</li> </ul>	<p>Medium</p> <p>1</p> <p>JICA</p>
<p><b>2.3 Technical knowledge in government agencies</b></p>	<p><b>Summary:</b> <i>Electricity Regulatory Agency (ERA) has significant experience in setting tariffs and issuing generation licences. It has a strong reputation in the region. Overall, the staff is very professional, but their experience, and the processes within the Agency are focused on hydropower, which is not easily transferable. Training on issues specific to geothermal energy will be needed.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>ERA as a regulator has experience in developing feed-in tariff guidance, but not specific to geothermal.</li> <li>The Electricity Regulatory Agency (ERA) has more capacity in terms of licensing for electricity generation and formulating/managing PPAs and feed-in tariff development.</li> <li>A technical assistance team is being provided to the regulator (ERA) as part of the Get Fit project; the focus will be on hydro and biogas, but could extend more widely if useful</li> </ul>	<p>Low/Medium</p> <p>2</p>
<p><b>2.4 Strength/Capacity of regulator</b></p>		

3. Resource Verification & Early Development			
3.1 Access to finance and risk mitigation products	<p><b>Summary:</b> <i>The main option for financing and risk mitigation at this stage is donors. The Uganda Energy Credit Capitalization Company (UECCC) is looking to provide transaction advisory and early stage financing, but they are small and have limited capital (and are likely better suited to small scale renewable energy).</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Uganda has access to ARGeo funds for surface studies including conceptual modeling and well siting and targeting.</li> <li>Support is also available from the Geothermal Risk Mitigation Facility (GRMF) for conducting detailed geophysical studies, developing conceptual models, siting and targeting wells and the drilling of reservoir confirmation wells.</li> </ul>	Low	2
3.2 Access to drilling rigs, ancillary drilling services	<p><b>Summary:</b> <i>Rigs are readily available throughout the region. Most rigs include ancillary services when hired, although there is some capacity in the country as well. The government is considering purchasing rigs that could be leased to private developers.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>There are some rigs in country that came from southern Sudan, as well as some from Mombasa; GDC also owns some rigs that could be used by Uganda</li> <li>Uganda has also been working with Chinese firms. Hiring rigs from Chinese firms is proving cheaper than maintaining own rig, but international standards may not be upheld</li> <li>Civicon is an engineering and drilling firm with offices in Uganda. They have experience at Menengai in Kenya</li> <li>Drilling rigs are increasingly available in the region as is support services.</li> <li>Currently, the Ministry is looking at purchasing drilling equipment that could be leased by private developers. Note: the geothermal community would highly advise against this</li> </ul>	Medium	2
3.3 Clear permitting process	<p><b>Summary:</b> <i>The permitting process is generally clear, but can be time consuming and some potential for overlap/conflict exists with the parallel permitting requirements from ERA. The pending draft Geothermal Act should solve these issues, along with the issue of converting from an exploration license to a project development license, which is currently inadequately covered in the Mining Act.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>The environmental and social impact assessment (EIA) is a long process, but rather straightforward if included in the early stages of project planning and development. In their application (project brief), developers must be clear on how they will mitigate potential</li> </ul>	Low/Medium	2

	<p>environmental and social issues at each stage of development, construction, and operations.</p> <ul style="list-style-type: none"> <li>Mining lease for 21 years; renewable for two periods of 15 years each; at each stage of development, a new EIA is required (an ongoing process)</li> <li>Developers also need permit from ERA; there is potential for duplication with exploration permitting process</li> <li>Before feasibility studies, permit from regulator is required</li> </ul>	
3.4 Human capital – resource development	<p><b>Summary:</b> <i>Many staff as well as supervisors have considerable experience in geothermal exploration and a number have attended the UNU or other geothermal training programs either in Africa, Iceland or New Zealand. However a lack of opportunities in geothermal often result in these individuals working in other fields of geology or hydrology, or working for private sector companies in addition to their duties with the government.</i></p> <p><i>There is a need to build capacity in the private sector and/or leverage expertise from around the region.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>Biggest challenge has been on geophysics in terms of surface data collection</li> <li>Also have limited experience on drilling, but this is at a later stage; thus focusing on training staff with GDC to complete surface and subsurface studies</li> </ul>	
	<h4>4. Project Financing</h4>	<p><b>4.1 Credit-worthy off-taker</b></p> <p><b>Summary:</b> <i>The power sector in general is fraught with issues that limit the off-taker's ability to pay. Poor revenue collection and distribution losses mean the distribution companies often has issues paying the transmission company, UETCL, which is also the off-taker. In general, the off-taker often makes late payments, but is not currently in default. Tariffs are not cost reflective. There are partial risk guarantees available to mitigate the systemic issues and protect developers.</i></p> <p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>The off-taker is UETCL, an autonomous government-owned entity</li> <li>There are about 30 distributors in sector now; it is not clear all of these have the capacity to manage collections properly.</li> <li>The World Bank provides partial risk guarantees for projects under the GetFit program that could be applied to geothermal projects</li> </ul> <p><b>Summary:</b> <i>Standardized PPAs exist, and are approved by ERA. AAE recently signed a PPA with ERA for their concession at Kasese. ERA has experience in negotiating PPAs based on developer agreement</i></p>

negotiation process / mechanisms	costs and expected rate of return (thought to be 10-15% target).
	<p><b>Detail:</b></p> <ul style="list-style-type: none"> <li>• Government guarantee of UETCL payment exists, and is included in the implementation agreement for the PPA.</li> <li>• Project financing exists locally (though not for geothermal); loan tenors are typically this is 6-7 years; but can be extended to 12-15 years with donor guarantees. It is unclear at what interest rates financing would be available for geothermal, if at all.</li> </ul>
4.3 Human capital – project finance	<p><b>Summary: UETCL has project finance experience, but primarily for small scale renewables, and not geothermal. ERA recently concluded negotiations with AAE for a PPA on their concession at Kasese.</b></p>
<b>5. Construction</b>	<b>Clear laws exist for construction permitting, but not specifically for geothermal</b>
5.1 Construction permitting process	Low
5.2 Human capital – construction	Low
<b>6. Operations</b>	<b>No direct geothermal expertise</b>
6.1 Human capital – operations	Low



## UGANDA PRIORITIZED RECOMMENDATIONS

	0-12 Months Priority 1	12-24 Months Priority 2	24+ months Priority 3
<b>1. Pre-Conditions for Market Entry<sup>29</sup></b>	<ul style="list-style-type: none"> <li>Development of geothermal act</li> </ul>		
<b>2. Resource Assessment and Capture</b>	<ul style="list-style-type: none"> <li>Surface and subsurface studies, data collection and analysis; based on results, determine future priorities for geothermal</li> <li>Focus on licensing process in geothermal act. Training on geophysical studies and analysis</li> </ul>	<ul style="list-style-type: none"> <li>Expand technical assistance to ERA under GetFit program to build capacity for geothermal</li> </ul>	
<b>3. Resource Verification and Early Development</b>	<ul style="list-style-type: none"> <li>Address permitting issues in new geothermal act</li> </ul>	<ul style="list-style-type: none"> <li>Analyze cost/benefit of government procuring rigs to lease to private sector</li> <li>Explore leasing rigs on a regional basis—costs, mobilization logistics, contractual agreements, etc.</li> <li>On-the-Job training in drilling through MOU with GDC</li> </ul>	
<b>4. Project Financing</b>			<ul style="list-style-type: none"> <li>Look at risk mitigation mechanisms to address systemic issues in power sector (e.g., partial risk guarantees on off-take)</li> </ul>
<b>5. Construction</b>			<ul style="list-style-type: none"> <li>Continue to update in skills assessment; no immediate action or planning priorities</li> </ul>
<b>6. Operations</b>			<ul style="list-style-type: none"> <li>Continue to update in skills assessment; no immediate action or planning priorities</li> </ul>

<sup>29</sup> While improvements in contract sanctity and governance are clearly paramount for Uganda, this is beyond the scope of a geothermal strategy, and is therefore not addressed in the recommendations.



## APPENDIX E: RANKING FACTORS

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The ranking factors below are the assessment criteria used to determine a country's overall strength by indicator. A “low” ranking indicates very little or no progress/activity for a given indicator, while a medium ranking indicates some progress, but still room for improvement. A ranking of “high” indicates that the country is on par with other successful models for geothermal development internationally. Because geothermal development is nascent in all of the countries except for Kenya, most countries receive a majority of “low” or “medium” rankings.

## Ranking Factors

Indicator	Low	Medium	High
<b>1. Preconditions for Market Entry</b>			
<b>1.1 Government support – Legal/Policy</b>	Little to no public support and no policy guidance in place supporting renewable energy; No specific legal framework for geothermal development; existing legal framework does not provide clarity on tendering, exploration, and development process.	Support for renewable energy, but government priorities lack clarity or public support. Government support not reflected in priorities for policy change, development, etc.; Some legislation in place governing geothermal energy, but key questions remain open to interpretation; OR more broad/vague energy law currently applied to geothermal development	Strong awareness of geothermal benefits and clear public support. Clear policy in place supporting geothermal / renewables. Clear and enforceable law governing geothermal energy sector in place; processes, procedures, and legal precedents in place.
<b>1.2 Government support – Tariff regime</b>	No standardized tariff regime (Feed-in tariff) in place. Market prices are low, and unlikely to support profitable geothermal development, and no incentives exist to bridge this gap.	Feed-in tariff or other incentives exist, but may be “one size fits all” or not sufficient to provide market return for investor. If no, Feed-in tariff, market prices indicate likelihood of PPA with a commercially viable price.	Feed-in Tariffs are sufficient to generate market returns for investors. Range of tariffs available for different size resources, as well as more remote resources. If no, FiT, process for negotiating and securing bankable PPA is clear and established Guarantees available for off-take risk.
<b>1.3 Risk Mitigation facilities and mechanisms to ensure contract sanctity in place</b>	No investor protection law or dispute resolution mechanism in place Few or no risk mitigation facilities in place in local market; or facilities are poorly suited to market deficiencies	Investor protection laws or dispute resolution mechanisms exist, but may be cumbersome or prone to legal challenges Some risk mitigation facilities exist, but some critical gaps exist in product matching given market deficiencies; facilities are largely donor-driven, not from government or private sector	Clear, enforceable investor protection law and dispute resolution provisions in place Comprehensive suite of risk mitigation facilities in place, including partial risk guarantees, appropriate insurance products, and/or government guarantees
<b>2. Resource Assessment &amp; Capture</b>			
<b>2.1 Surface and sub-surface data</b>	No data exists for fields that have been drilled or explored by government.	Some data exists but it may be incomplete or improperly managed.	Robust data exists for publicly developed fields and is appropriately managed to provide relevant inputs for private developers to access the data.
<b>2.2 Legal framework for concession and development rights</b>	No legal framework or tendering process in place for obtaining concessions; all rights must be negotiated on an ad hoc basis	Legal framework to obtain and develop concession is in place, but may be difficult to negotiate or have major gaps in regulation or in key features including tenure or investment requirements	Clear process to obtain and develop concessions. Surface and subsurface rights are clear, and process covers all key facets of development.
<b>2.3 Technical knowledge in government agencies</b>	Government agencies and policy have little to no prior experience or knowledge of geothermal development	Government agencies have staff with experience in renewables policy broadly; who may have training exposure to geothermal but no prior experience in the area	Government agencies have staff with prior experience in geothermal exploration and development
<b>2.4 Strength / capacity of regulator</b>	No clear legal mandate exists for regulation in the sector	Regulator staff may have limited background in geothermal energy and/or legal mandate of regulator may be unclear or open to challenge	Designated industry regulator is staffed with competent and experienced professionals with exposure to geothermal development issues; regulator has clear legal mandate for activities
<b>3. Resource Verification &amp; Early Development</b>			

<b>Indicator</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>3.1 Access to finance &amp; risk mitigation products</b>	Finance for drilling is difficult to access in local market. Donors are not active.	Some financial resources are available to drillers, but there may be gaps in availability, especially related to risk mitigation. Donors are active, but facilities may be limited	Capital/loans/grants are readily available for drilling and easily accessible to potential developers from both donor and (increasingly) private sector
<b>3.2 Access to drilling rigs, ancillary services</b>	No drilling services or rigs exist in local market; importation of equipment is complicated and costly	Limited drilling services exist in local market and/or importation of drilling equipment is difficult	Rigs and services exist in local market or are easy and efficient to procure and import
<b>3.3 Clear permitting process</b>	No clear process for obtaining drilling permits exists and/or permits must be negotiated on an ad hoc basis	Process to obtain drilling permits exists, but is complicated to navigate	Process to obtain drilling permits is clear and simple
<b>3.4 Human capital – resource development</b>	Individuals responsible for/managing development activities have little to no past exposure to geothermal and lack in critical areas of expertise.	Individuals responsible have reasonable past experience with geothermal; while additional training may be needed in some aspects of resource development, personnel are familiar with basic principles critical to development.	Individuals responsible for managing development risk have credible expertise and past experience with geothermal development.
<b>4. Project Financing</b>			
<b>4.1 Credit-worthy Off-taker</b>	Off-taker has weak credit/business history and difficulty accessing finance	Off-taker has mid-level credit rating and few risk mitigation mechanisms exist	Off-taker has viable credit rating, or risk mitigation mechanisms exist
<b>4.2 Off-take agreement negotiation process / mechanisms in place</b>	No standardized PPA/off-take agreement negotiation process exists or standardized process is extremely weak; negotiations are largely ad hoc and few past, enforceable precedents to set expectations in local market.	Off-take negotiation process is clear, but may lack coverage in some key areas, or in transparency or efficiency. (Key areas -- Forex, Change in law/tax, Force Majeure, Offshore Arbitration, Termination Provision, Transmission/ Interconnect Risk, Duration commensurate with financing); no guarantees available for off-take risk.	Negotiation process is clear and negotiations cover all critical areas; precedent for enforceable agreements exists in local market (Forex, Change in law/tax, Force Majeure, Offshore Arbitration, Termination Provision, Transmission/ Interconnect Risk, Duration commensurate with financing)
<b>4.3 Human capital – project finance</b>	Government staff have little to no commercial experience and extremely limited exposure to cost recovery and return on investment	Government staff have little to no commercial experience, but have training or other exposure to cost recovery and return on investment criteria	Government staff have experience developing economically viable projects, understand cost recovery and return on investment
<b>5. Construction</b>			
<b>5.1 Construction Permitting Process</b>	No clear permitting process for construction activities exists in local market	Process and/or authority for obtaining construction permits in local market is complicated, time consuming and/or costly	Process and authority for obtaining construction permits is clear and efficient
<b>5.2 Human capital – construction</b>	Minimal if any experience exists in local market to engineer, design, and construct plants. Labor must be imported.	Some expertise exists in local market, but experts still need to be brought in for complicated issues	Local expertise for most activities; only the most complicated technical issues require international experts
<b>6. Operations</b>			
<b>6.1 Human capital – operations</b>	Minimal if any experience exists in local market to operate and maintain plants. Labor must be imported.	Some expertise exists in local market, but experts still need to be brought in for complicated issues	Expertise exists such that only the most complicated maintenance issues require international experts to be brought in



## APPENDIX F: COUNTRY SNAPSHOTS

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In the section below, a summary of the rankings, priorities, and donor activities by each country is presented in a “snapshot” framework. Users of this snapshot tool should be able to quickly assess a country’s progress in terms of geothermal development, determine the most critical area for assistance and financing, and identify which donors are currently active in the space.

The first row under each phase shows the country ranking by indicator with one, two, or three diamonds (low, medium, high). The second row shows checkmarks for each donor with an activity addressing the indicator in some way. Finally, each indicator is highlighted either red, yellow, or green to indicate its priority level for assistance. Red indicates the indicator is a Priority 1, meaning it should be addressed immediately. Yellow is a Priority 2 (address in the next 12-24 months), and green is a Priority 3 (address after 24+ months).

The second page of the document indicates the specific donors with activities for each indicator. For further information about these activities, refer to Attachment E: Donor Activity Database



## **Geothermal Development Mapping DJIBOUTI**



POWER  
AFRICA



Indicators by Project Phase		6.1 Human capital – operations	6.2 Human capital – construction	5.1 Construction permitting process	4.3 Human capital – project finance	4.2 Off-take agreement negotiation process	4.1 Off-taker
1. Preconditions for Market Entry	1.1 Government Support – Legal/Policy	♦♦	♦	♦	♦	♦	♦
	1.2 Government support – Tariff regime	♦	♦	♦	♦	♦	♦
2. Resource Assessment and Capture	1.3 Contract Sanctity / Risk Mitigation	♦♦	♦	♦	♦	♦	♦
	2.1 Surface and sub-surface data	♦	♦	♦	♦	♦	♦
3. Resource Verification & Development	2.2 Concession & Development Rights	♦♦	♦	♦	♦	♦	♦
	1.1 Government Support – Legal/Policy	♦♦	♦	♦	♦	♦	♦
4. Project Financing	Rating	Donor	Rating	Donor	Rating	Donor	Rating
5. Construction	Rating	Donor	Rating	Donor	Rating	Donor	Rating
6. Operations	Rating	Donor	Rating	Donor	Rating	Donor	Rating

**Enabling Environment Strength Rating //♦ to ♦♦♦ | Number of Donors // ✓ = 1 active donor in area**

## Active Donors by Indicator Area

Indicator Area	Active Donor(s)
<b>1.1: Government Support – Legal/Policy</b>	Power Africa
<b>1.2: Government Support – Tariff Regime</b>	Power Africa
<b>1.3: Contract Sanctity</b>	None
<b>2.1: Surface &amp; Sub-Surface Data</b>	JICA
<b>2.2: Legal framework for concession and development rights</b>	Power Africa
<b>2.3: Technical knowledge in government agencies</b>	None
<b>2.4: Strength/Capacity of Regulator</b>	AFD (tentative)
<b>3.1: Access to finance and risk mitigation products</b>	GRMF
<b>3.2: Access to drilling rigs, ancillary drilling services</b>	World Bank/AfDB consortium, JICA
<b>3.3: Clear permitting process</b>	None
<b>3.4: Human capital – Resource development</b>	None
<b>4.1: Credit-worthy off-taker</b>	None
<b>4.2: Off-take agreement negotiation process/mechanisms</b>	None
<b>4.3: Human capital – Project finance</b>	None
<b>5.1: Construction permitting process</b>	None
<b>5.2: Human capital – Construction</b>	None
<b>6.1: Human capital – Operations</b>	None



## **Geothermal Development Mapping ETHIOPIA**



Indicators by Project Phase		Enabling Environment		Strength Rating //  to    Number of Donors //  = 1 active donor in area		Level of Priority // 1 =  2 =  3 =	
		Rating	Donor	Rating	Donor	Rating	Donor
1. Preconditions for Market Entry							
2. Resource Assessment and Capture							
3. Resource Verification & Development							
4. Project Financing							
5. Construction							
6. Operations							

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## Active Donors by Indicator Area

Indicator Area	Active Donor(s)
<b>1.1: Government Support – Legal/Policy</b>	AfDB, IFC, Power Africa
<b>1.2: Government Support – Tariff Regime</b>	AfDB, Power Africa
<b>1.3: Contract Sanctity</b>	None
<b>2.1: Surface &amp; Sub-Surface Data</b>	AFD, AfDB, ICEIDA, IFC, JICA, Power Africa
<b>2.2: Legal framework for concession and development rights</b>	AfDB, IFC
<b>2.3: Technical knowledge in government agencies</b>	IFC, World Bank
<b>2.4: Strength/Capacity of Regulator</b>	EU, USAID, DFID
<b>3.1: Access to finance and risk mitigation products</b>	AFD, GRMF, JICA, World Bank
<b>3.2: Access to drilling rigs, ancillary drilling services</b>	AFD, World Bank
<b>3.3: Clear permitting process</b>	IFC
<b>3.4: Human capital – Resource development</b>	AFD, ICEIDA, NZAID
<b>4.1: Credit-worthy off-taker</b>	None
<b>4.2: Off-take agreement negotiation process/mechanisms</b>	Power Africa, AfDB, EU, Swiss
<b>4.3: Human capital – Project finance</b>	Power Africa
<b>5.1: Construction permitting process</b>	None
<b>5.2: Human capital – Construction</b>	AfDB
<b>6.1: Human capital – Operations</b>	None



## **Geothermal Development Mapping KENYA**



## Indicators by Project Phase

Indicators by Project Phase		6.1 Human capital – operations	5.2 Human capital – construction	5.1 Construction permitting process	4.3 Human capital – project finance	4.2 Off-take agreement negotiation process	4.1 Off-taker
1. Preconditions for Market Entry	3.1 Access to finance / risk mitigation	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
	3.2 Access to drilling rigs & services	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
2. Resource Assessment and Capture	2.3 Technical knowledge – Government	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
	2.2 Concession & Development Rights	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
3. Resource Verification & Development	2.1 Surface and sub-surface data	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
	1.3 Contract Sanctity / Risk Mitigation	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
4. Project Financing	1.2 Government support – Tariff regime	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
	1.1 Government Support – Legal/Policy	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦	♦♦♦♦♦
5. Construction	Rating	Donor	Rating	Donor	Rating	Donor	Rating
	Rating	Donor	Rating	Donor	Rating	Donor	Rating
6. Operations	Rating	Donor	Rating	Donor	Rating	Donor	Rating
	Rating	Donor	Rating	Donor	Rating	Donor	Rating

Enabling Environment Strength Rating //  | Number of Donors // ✓ = 1 active donor in area

**Level of Priority // 1 =  2 =  3 = **

## Active Donors by Indicator Area

Indicator Area	Active Donor(s)
<b>1.1: Government Support – Legal/Policy</b>	IFC, JICA
<b>1.2: Government Support – Tariff Regime</b>	None
<b>1.3: Contract Sanctity</b>	None
<b>2.1: Surface &amp; Sub-Surface Data</b>	None
<b>2.2: Legal framework for concession and development rights</b>	KfW, Power Africa
<b>2.3: Technical knowledge in government agencies</b>	AFD, ICEIDA, JICA, KfW, Power Africa
<b>2.4: Strength/Capacity of Regulator</b>	None
<b>3.1: Access to finance and risk mitigation products</b>	AfDB, AFD, China, EIB, GRMF, JICA, KfW, Power Africa
<b>3.2: Access to drilling rigs, ancillary drilling services</b>	AfDB, AFD
<b>3.3: Clear permitting process</b>	Power Africa
<b>3.4: Human capital – Resource development</b>	JICA, Power Africa, World Bank
<b>4.1: Credit-worthy off-taker</b>	None
<b>4.2: Off-take agreement negotiation process/mechanisms</b>	Power Africa
<b>4.3: Human capital – Project finance</b>	ICEIDA, AfDB, Power Africa
<b>5.1: Construction permitting process</b>	None
<b>5.2: Human capital – Construction</b>	Iceland, AfDB
<b>6.1: Human capital – Operations</b>	None



## **Geothermal Development Mapping RWANDA**

**Enabling Environment Strength Rating //♦ to ♦♦♦ | Number of Donors // ✓ = 1 active donor in area**



## Active Donors by Indicator Area

Indicator Area	Active Donor(s)
<b>1.1: Government Support – Legal/Policy</b>	EU
<b>1.2: Government Support – Tariff Regime</b>	Power Africa (tentative)
<b>1.3: Contract Sanctity</b>	None
<b>2.1: Surface &amp; Sub-Surface Data</b>	EU, JICA
<b>2.2: Legal framework for concession and development rights</b>	None
<b>2.3: Technical knowledge in government agencies</b>	EU, JICA, Power Africa (tentative)
<b>2.4: Strength/Capacity of Regulator</b>	None
<b>3.1: Access to finance and risk mitigation products</b>	None
<b>3.2: Access to drilling rigs, ancillary drilling services</b>	None
<b>3.3: Clear permitting process</b>	None
<b>3.4: Human capital – Resource development</b>	None
<b>4.1: Credit-worthy off-taker</b>	None
<b>4.2: Off-take agreement negotiation process/mechanisms</b>	None
<b>4.3: Human capital – Project finance</b>	None
<b>5.1: Construction permitting process</b>	None
<b>5.2: Human capital – Construction</b>	None
<b>6.1: Human capital – Operations</b>	None



## Geothermal Development Mapping TANZANIA



Indicators by Project Phase		Geothermal Development Mapping Tanzania											
		1. Preconditions for Market Entry		2. Resource Assessment and Capture		3. Resource Verification & Development		4. Project Financing		5. Construction		6. Operations	
		Rating	Donor	Rating	Donor	Rating	Donor	Rating	Donor	Rating	Donor	Rating	Donor
1.1 Government Support – Legal/Policy		♦		♦		♦							
1.2 Government support – Tariff regime													
1.3 Contract Sanctity / Risk Mitigation													
2.1 Surface and sub-surface data						♦♦		♦♦		♦		♦♦	
2.2 Concession & Development Rights						♦		♦					
2.3 Technical knowledge – Government						♦		♦		♦		♦	
3.1 Access to finance / risk mitigation													
3.2 Access to drilling rigs & services													
3.3 Permitting process													
4.1 Off-taker													
4.2 Off-take agreement negotiation process													
4.3 Human capital – project finance													
5.1 Construction permitting process													
5.2 Human capital – construction													
6.1 Human capital – operations													

Enabling Environment Strength Rating //♦ to ♦♦♦ | Number of Donors // ✓ = 1 active donor in area  
Level of Priority // 1 = 2 = 3 =

## Active Donors by Indicator Area

Indicator Area	Active Donor(s)
<b>1.1: Government Support – Legal/Policy</b>	AfDB, DFID, SIDA
<b>1.2: Government Support – Tariff Regime</b>	None
<b>1.3: Contract Sanctity</b>	None
<b>2.1: Surface &amp; Sub-Surface Data</b>	JICA, BGR, AfDB
<b>2.2: Legal framework for concession and development rights</b>	AfDB, DFID, World Bank
<b>2.3: Technical knowledge in government agencies</b>	DFID, World Bank
<b>2.4: Strength/Capacity of Regulator</b>	None
<b>3.1: Access to finance and risk mitigation products</b>	None
<b>3.2: Access to drilling rigs, ancillary drilling services</b>	AfDB
<b>3.3: Clear permitting process</b>	None
<b>3.4: Human capital – Resource development</b>	None
<b>4.1: Credit-worthy off-taker</b>	None
<b>4.2: Off-take agreement negotiation process/mechanisms</b>	None
<b>4.3: Human capital – Project finance</b>	None
<b>5.1: Construction permitting process</b>	None
<b>5.2: Human capital – Construction</b>	None
<b>6.1: Human capital – Operations</b>	None



 Geothermal Development Mapping  
UGANDA



**Enabling Environment Strength Rating //♦ to ♦♦♦ | Number of Donors // ✓ = 1 active donor in area**

## Active Donors by Indicator Area

Indicator Area	Active Donor(s)
<b>1.1: Government Support – Legal/Policy</b>	Power Africa, World Bank
<b>1.2: Government Support – Tariff Regime</b>	KfW (for small scale)
<b>1.3: Contract Sanctity</b>	None
<b>2.1: Surface &amp; Sub-Surface Data</b>	JICA, Power Africa
<b>2.2: Legal framework for concession and development rights</b>	Power Africa, World Bank
<b>2.3: Technical knowledge in government agencies</b>	JICA
<b>2.4: Strength/Capacity of Regulator</b>	None
<b>3.1: Access to finance and risk mitigation products</b>	None
<b>3.2: Access to drilling rigs, ancillary drilling services</b>	None
<b>3.3: Clear permitting process</b>	None
<b>3.4: Human capital – Resource development</b>	None
<b>4.1: Credit-worthy off-taker</b>	None
<b>4.2: Off-take agreement negotiation process/mechanisms</b>	None
<b>4.3: Human capital – Project finance</b>	None
<b>5.1: Construction permitting process</b>	None
<b>5.2: Human capital – Construction</b>	None
<b>6.1: Human capital – Operations</b>	None



## APPENDIX G: DONOR ACTIVITY DATABASE

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Donor Project Database						
Org	Org	Country	Country	Recipient	Activity	Value (USD)
PA		Djibouti		GoD	Assistance to improve enabling environment for private sector geothermal development (including tariff regime)	On-going
PA		Djibouti		GoD	Capacity building and training to ODDEG (and EDD, CERD as applicable)	On-going
AFD		Djibouti		GoD	Assistance to EDD to review financial position and develop solutions to strengthen it	Future--tentative
WB	AfDB	Djibouti		GoD	Technical assistance and funding for exploratory drilling in the Fiale Caldera (called the "Lake Assal project"), to be followed by IPP tender for remaining drilling and development	\$ 31,000,000 On-going
JICA		Djibouti		GoD	Surface studies and analysis at Hanle resource	on-going
JICA		Djibouti		GoD	Test drilling at Hanle	Future--tentative
EU	KfW	AUC	East Africa	Kenya	GRMF--grants for 40% drilling costs, 20% infrastructure, 30% exploration, 80% surface	
UNEP			East Africa	Kenya	ARGE: regional information network/database + capacity building; potential surface site surveys	\$ 17,000,000



Donor Project Database						
Org	Org	Country	Country	Recipient	Activity	Value (USD)
Iceland		East Africa			Survey and surface exploration in 4-7 countries. Includes test well prep, some policy assistance (requests come from countries)	\$ 12,000,000 on-going
Iceland	WB	East Africa	Burundi	Uganda	13 country assessment of geothermal development by stages; Burundi, Uganda Ethiopia have signed on	
BGR		East Africa	Rwanda	Kenya	Survey and surface exploration; Rwanda, Kenya, Tanzania	on-going
PA		East Africa			Technical assistance for policy and regulatory development	
WB		East Africa	Kenya		ESMAP--road map for geothermal in Africa	
IFC		East Africa			Insurance mechanism from Turkey	Future--tentative
IFC		East Africa			Detailed market assessment for geothermal	complete
PA					Technical assistance for policy and regulatory development (was part of Africa Infrastructure Program)	
PA		East Africa	Kenya		Training and capacity development under AUC	\$ 35,000,000 complete
PA		East Africa	Kenya		Support for geothermal road show to the US	Future--tentative
PA		East Africa				complete

Donor Project Database							
Org	Org	Country	Country	Recipient	Activity	Value (USD)	Status
PA		East Africa			Development of financing mechanism for geothermal drilling (exploration and production)		Future--certain
Iceland		East Africa			Feasibility study and design for regional Center of Excellence		on-going
DFID		East Africa			EAGER-rapid response mechanism focused primarily on policy/enabling environment for geothermal		On-going
AfDB	Ethiopia	GOE		Legal support for Corbettii			on-going
BGR	Ethiopia	GOE		"Geo-scientific exploration for development of the Tendaho geothermal system" phase I			complete
BGR	Ethiopia	GOE		Geo-scientific exploration for development of the Tendaho geothermal system phase II-- preparation for financing plan for Ministry of Mines and Energy			
BGR	Ethiopia	GOE		Further support for Tendaho field, plus regulatory advice and capacity building (GEOOTHERM project)			on-going

Donor Project Database							
Org	Org	Country	Country	Recipient	Activity	Value (USD)	Status
AfDB	Ethiopia			GOE	Aluto Langano appraisal and production drilling, project preparation grant, power plant and transmission line construction (SREP funds)	\$ 176,000	on-going
IFC	Ethiopia			GOE	Grant for Aluto Langano (component II) (SREP funds)	\$ 1,500,000	on-going
WB	Ethiopia			GOE	Financing of drilling at AlutoLangano and Alalobad, financing of drilling rigs (SREP funds)	\$ 20,000,000	on-going
JICA	Ethiopia			GOE	Geological survey and master plan		on-going
JICA	Ethiopia	Djibouti	Rwanda		Assessment of geothermal potential (surface study analysis)		on-going
Government	Ethiopia			GOE	Reconnaissance studies at Cortetti, Abaya, Tulu Moye, Dofan, Fantale		Unknown
Iceland	Ethiopia			GOE	Technical assistance and capacity building grant focused on Aluto-Longano	\$ 3,500,000	Unknown
Government	Ethiopia			GOE	Equity contribution for Aluto-Longano	\$ 12,000,000	Unknown
JICA	Ethiopia			GOE	Loan to 2x35MW power plants at Aluto-Longano	\$ 110,000,000	Unknown
AFD	Ethiopia			GOE	Financing of drilling at Tendaho Dubti		on-going
PA	Ethiopia			GOE	Training in PPA negotiation		on-going
PA	Ethiopia			GOE	Assistance in negotiation of PPA at Corbettii		on-going
PA	Ethiopia			GOE	Geothermal data management		on-going

Donor Project Database							
Org	Org	Country	Country	Recipient	Activity	Value (USD)	Status
AfDB		Ethiopia		GOE	Assistance with development of PPP Law-- through ALSF		on-going
PA		Ethiopia		GOE	Development of Geothermal law/proclamation		on-going
IFC		Ethiopia		GOE	Comprehensive analysis and recommendations of structures and models for geothermal development		Complete
IFC		Ethiopia		GOE	Implementation of recommendations from comprehensive analysis-- sector strategy, licensing framework, institutional framework		on-going
EU		Ethiopia		GOE	Model PPAs, other key documents for energy generation (sector-wide)		on-going
Swiss		Ethiopia		GOE	PPA workshops?		Unknown
NZ		Ethiopia		GOE	Drilling regulations and standards		on-going
JICA		Kenya		GDC	Capacity strengthening for GDC	\$ 18,000,000	on-going
JICA		Kenya		GOK	Master plan		on-going
AfDB		Kenya		Private developer	Partial risk guaranteee for steamfield and off-take at Menengai	\$ 22,815,221	on-going
AfDB	EU	AFD Kenya		GOK	Mombasa-Kenya transmission line		on-going
AfDB	AFD	WB Kenya	Ethiopia	GOK	Kenya-Ethiopia transmission line		on-going
AfDB		Kenya		GDC	Menengai phase I - 400 MW	\$ 96,000,000	on-going

Donor Project Database						
Org	Org	Org	Country	Country	Recipient	Activity
						Value (USD)
WB	AFD	Kenya		GDC	Menengai phase II--400 MW steam gathering system	on-going
AfDB	EIB	Kenya		Private developers	Menengai 107 MW fast track	on-going
Iceland	AfDB	Kenya		GDC	GDC capacity building at Menengai	\$ 120,000,000
Munich Re		Kenya		Private developer	Drilling insurance for AGIL	on-going
Munich Re		Kenya		Private developer	Drilling insurance for Akiira	On Hold
AfDB		Kenya		Private developers	Partial Risk guarantee for steam collection system and transmission line	On-going
JICA		Kenya		KenGen	Plant finance for Olkaria I, units 4&5	\$ 45,900,000
JICA		Kenya		KenGen	Plant finance for Olkaria I, unit 6 (using savings from finance of units 4&5)	on-going
JICA		Kenya		KenGen	Plant Finance for Olkaria V-- 140 MW	on-going
EIB		Kenya		KenGen	Plant finance for Olkaria I, units 4&5--280MW	on-going
EIB		Kenya		KenGen	BOP finance for Olkaria I, unit 6 (in cooperation with JICA)	\$ 89,000,000
EIB		Kenya		GDC	Interest rate subsidy for GDC drilling costs as part of Olkaria (KenGen) financing	\$ 56,179,775
AFD		Kenya		Private developer	Partial financing of 35MW generation capacity at Olkaria III	Future--tentative
AFD	EIB	Kenya		KenGen	Co-financing of Olkaria II plant (extension of Unit 3)-- 35MW	\$ 13,350,000
AFD		Kenya		KenGen	Extension of 280MW plant	on-going
						Unknown



Multi-Donor Strategy for Geothermal Development in East Africa—FINAL VERSION  
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